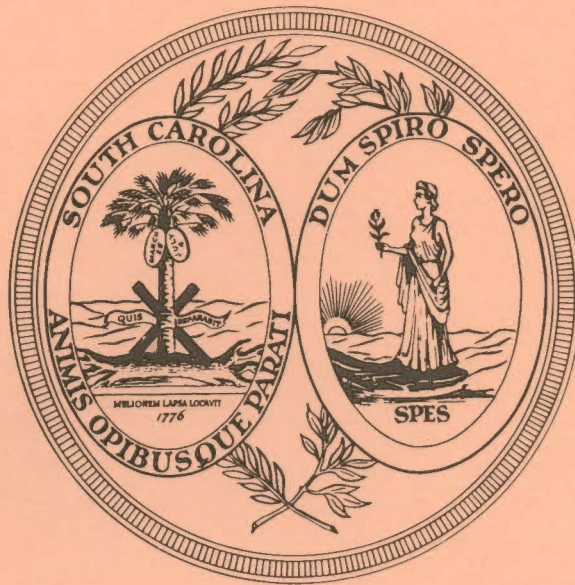


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CLEMSON UNIVERSITY



ANNUAL REPORT 1992-1993

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CLEMSON UNIVERSITY

PRESIDENT

Last year when we wrote of the opportunity in challenge, little did we know just how great our challenges would be!

The past year's further erosion of state budget support not only challenged the fiscal health of the University but — more distressingly — threatened to undermine the important relationships that are inextricably tied to our financial security.

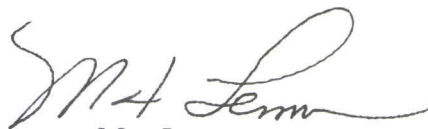
The cumulative impact of our economic woes is undeniable: Good students have been turned away from Clemson. Those who did manage to enroll often have been frustrated because they couldn't get the courses they wanted. Faculty members continue to feel pressured to devote more of their limited time to the search for external financial support. Staff morale has taken a double dose of hard medicine as positions left vacant increase workloads while departments can offer no hope of increased compensation. And we see no evidence that state budget relief is imminent.

In such times as these, the tendency is to turn inward, to focus on short-term solutions to our immediate problems. But for a University which deals in preparing students for the future and in teaching them to dream of a better world, such a narrow focus is disastrous.

So, our challenge this year has been to stay connected to those individuals, organizations and institutions that hold some stake in Clemson University and its success. To listen to their needs and demands and respond quickly and appropriately. To allow ourselves the luxury of planning for better times and, through such plans, to ensure that better times will be possible.

In keeping with our vision of becoming the nation's leading technologically oriented land-grant university, Clemson University lives by the mandate of providing teaching, research and public service — first and foremost to the citizens of South Carolina, but also to those beyond the state's boundaries who seek what the University has to offer. What will that be?

The signs are unmistakable that Clemson will emerge from the lean 1990s a better, stronger, more relevant University in touch with its stakeholders and connected to the world of the future. A future that is taking shape, even now.



Max Lennon

President

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UNIVERSITY HISTORY

Thomas Green Clemson, the University's founder, was born in Philadelphia and educated in the United States and Europe. He was a champion of formal scientific education and had a lifelong interest in agricultural affairs and farming.

He came to the foothills of South Carolina when, in 1838, he married Anna Maria Calhoun, daughter of South Carolina's famous statesman John C. Calhoun.

In the post-Civil War days of 1865, Thomas Clemson looked upon a South that lay in economic ruin, once remarking that "this country is in wretched condition, no money and nothing to sell. Everyone is ruined, and those that can are leaving."

When Thomas Clemson died on April 6, 1888, it set in motion a series of events which marked the start of a new era in higher education in the state of South Carolina. Mr. Clemson left most of his estate to be used to establish a college that would teach scientific agriculture and the mechanical arts to the young people of South Carolina.

In his will, he bequeathed the Fort Hill plantation and a considerable sum from his personal assets for the establishment of an educational institution of the kind he envisioned.

In November 1889, Governor Richardson signed the bill accepting Thomas Clemson's gift which established the Clemson Agricultural College, with its trustees becoming custodians of Morrill Act and Hatch Act funds made available for agricultural education and research purposes by federal legislative acts.

Although he also is remembered today for other accomplishments, Thomas Clemson made his greatest historical contribution when his life became intertwined with the destiny of educational and economic development in South Carolina. Although he never lived to see it, his dedicated efforts culminated in the founding of Clemson Agricultural College of South Carolina.

Clemson College formally opened in July 1893 with an enrollment of 446. From the beginning, the college was an all-male military school. It remained this way until 1955 when the change was made to "civilian" status for students, and Clemson became a coeducational institution. In 1964 the college was renamed Clemson University as the state Legislature formally recognized the school's expanded academic offerings and research pursuits. Today, a century after its opening, the University is much more than its founder ever could have imagined or hoped for. With its diverse learning and research facilities, the University provides an educational opportunity not only for the people of the state, as Mr. Clemson dreamed, but for thousands of young men and women throughout the country and the world.

1992-93 ADMINISTRATIVE OFFICERS

Executive

Max Lennon, Ph.D.President
J. Charles Jennett, Ph.D.Provost and Vice President for Academic Affairs
Manning N. Lomax, B.S.Vice President for Administration
and Secretary of the Board of Trustees
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David R. Larson, M.B.A.Vice President for Business and Finance
Gary A. Ransdell, Ed.D.Vice President for Institutional Advancement
G. Jay Gogue, Ph.D.Vice President for Research
Almeda Jacks, M.Ed.Vice President for Student Affairs
Benjamin Anderson, J.D.General Counsel

Academic

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Milton B. Wise, Ph.D.Vice President and Vice Provost for
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DeWitt B. Stone, Jr., Ph.D.Assistant Vice President for Academic Affairs
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A. Wayne Bennett, Ph.D.Senior Vice Provost and Dean of the
Graduate School
Christopher J. Duckenfield, Ph.D.Vice Provost for Computing and
Information Technology
Joseph F. Boykin, Jr., M.S.Director of Libraries
Robert H. Becker, Ph.D.Director of the Strom Thurmond Institute
for Government and Public Affairs
T. Ross Wilkinson, Ph.D.Dean of Academic Affairs, College of
Agricultural Sciences
James R. Fischer, Ph.D.Dean, Agricultural Research and Director, S.C.
Agricultural Experiment Station
Byron K. Webb, Ph.D.Dean and Director, Cooperative Extension Service
James F. Barker, M.A.Dean, College of Architecture
Jerry E. Trapnell, Ph.D.Dean, College of Commerce and Industry
Gordon W. Gray, Ed.D.Dean, College of Education
Thomas M. Keinath, Ph.D.Dean, College of Engineering
Benton H. Box, D.F.Dean, College of Forest and Recreation Resources
Robert A. Waller, Ph.D.Dean, College of Liberal Arts
Opal Hipps, Ph.D.Dean, College of Nursing
Bobby G. Wixson, Ph.D.Dean, College of Sciences

1992-93 BOARD OF TRUSTEES

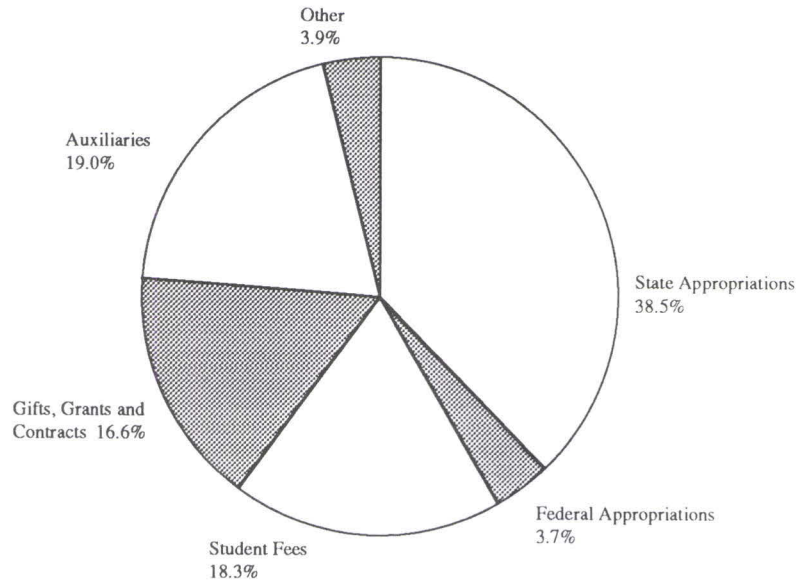
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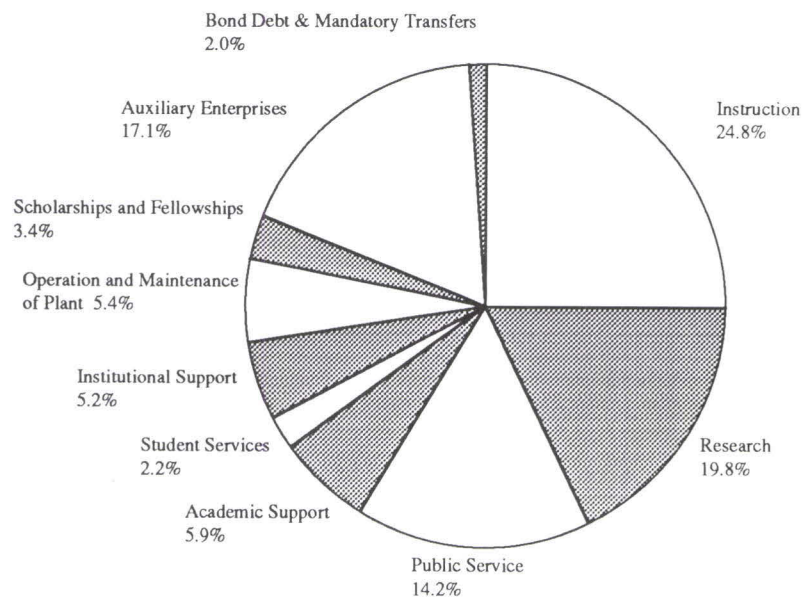
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William N. Geiger, Jr.	Columbia
Paul W. McAlister	Laurens
Paul Quattlebaum, Jr.	Charleston
James C. Self	Greenwood
D. Leslie Tindal.....	Pinewood
James M. Waddell, Jr.	Beaufort

CURRENT FUND REVENUES AND EXPENDITURES FOR THE YEAR ENDED JUNE 30, 1993

Current Fund Revenues



Current Fund Expenditures



COLLEGE OF AGRICULTURAL SCIENCES

The report of 1992-93 activities for the College of Agricultural Sciences' academic, research and Extension programs is included under the Division of Agricultural and Natural Resources on Page 64.

COLLEGE OF ARCHITECTURE

As the result of commitments made by faculty and students, the College of Architecture enjoyed its finest year ever in 1992-93. The following benchmarks demonstrate this success:

- Alumni Professor and ACSA National Distinguished Professor Peter Lee completed a Fulbright Teaching Fellowship to Jordan.
- The Department of Planning Studies was visited by the Planning Accreditation Board, and the visiting team found the department well-positioned to move to national prominence.
- The largest single gift ever given to Clemson University (\$2.85 million) was given to the College of Architecture from the will of Mrs. Charles E. Daniel, establishing the Homer Curtis Mickel and Leola Carter Mickel Chair in Architecture and a \$2.1 million scholarship/fellowship program for students in the college.
- S.C.'s first graduates in landscape architecture completed the B.L.A. in the college, and these 15 graduates received their degrees during May commencement ceremonies.
- In a special presentation, the master of architecture program received a commendation of excellence as a "program of national prominence" from the S.C. Commission on Higher Education (CHE).
- Working with the Associated Builders and Contractors, the Department of Construction Science and Management strengthened its position as the national leader in continuing education in construction. The ABC/Clemson academies have served 1,350 professionals in 54 six-day academies at Clemson.
- The inaugural holder of the college's first professorship (The Robert Mills Professorship) was named. Emilio Ambasz will be the Robert Mills Professor for the 1993-94 academic year.
- Faculty in the Art Department have participated in national and international professional activities through their research and creative work. Alumni Professor Cecilia Voelker had her research published in the catalog of the Genoa exhibition, and Professors Syd Cross and Mike Vatalaro were selected to exhibit in national exhibitions in New York, Arizona and Texas.

These benchmarks indicate some of the unique qualities of the College of Architecture and provide momentum to our efforts to become a College of Architecture seen as America's finest.

The future will demand that we continue to understand our uniqueness and shape our efforts around the needs of our students. The challenges our graduates will face in their professional lives is the driving force behind the teaching, creative activity and public service of the College of Architecture.

Special Programs

The Clemson Architectural Foundation Lecture Series, supported by donations to the Clemson Architectural Foundation, sponsored the following speakers for the academic year 1992-93:

September 14....James Wines.....	"Bionomic Building: Architecture in the Age of Ecology" Richtex Brick Lectureship
October 19.....Kemp Mooney	"Current Projects" S.C. Forestry Association Lectureship
November 4.....William C. Brunfield ..	"The Iconography of Medieval Russian Church Architecture" (Co-sponsored by Department of History, College of Liberal Arts and Calhoun Honors College)
November 9.....Marco Frascari	"The Graphic Trade of Architecture" Metromont Materials Lectureship
November 20....Cesar Pelli	"Works and Thoughts" Architects Boudreaux, Hulstrand & Carter, Ltd. Lectureship
February 19 ....Todd Williams and.....	"Asking Questions" CRSS Architects Inc. Lectureship
March 1 .....Susan Child.....	"Art in the Landscape" Holman, Inc.—Santee Cement Lectureship
March 8 .....Diane Ghirardo.....	"Architecture in the City" CAF Lectureship
March 22.....Alan Plattus.....	"A Space of Difference" CAF Lectureship

The Rudolph E. Lee Gallery is the University's art gallery, and the following exhibitions were shown last year:

August 21 - September 25.....	Art by Odell
October 5 - 30.....	Faculty Show
November 16 - December 6.....	New American Figure Painting
December 7 - January 4.....	MFA Thesis Exhibition
January 11 - February 3.....	Sydney A. Cross
February 8 - 28.....	From the Outside In
March 8 - April 4.....	National Print and Drawing Exhibition

Department of Architectural Studies

This has been a very good year for the department. Last year we were notified we had been nominated for special recognition by the CHE as a result of an unusually successful review by the NAAB. In March the CHE awarded our master of architecture program a plaque declaring it to be "a program of national prominence" — their highest honor.

While the review of our programs provided mostly positive feedback, we have set in motion certain strategies to address the concerns and questions brought about by the visit.

The past five years have been a time of change within the department. During this time we have added new faculty members who are replacing many of the founding members of our teaching and learning community. The process of drafting the "folklore" of the department — a sort of handbook of departmental values — continues and has begun to take shape in the form of what we now call our "frame-

work" for teaching and learning. Through the coming year this framework will continue to develop by encompassing ideas of students, teachers and practitioners.

We have solidified our structure of programs, and this report will highlight aspects of each of the 10 interrelated programs of the department.

Pre-Enrollment

Yuji Kishimoto
Lolly Tai
Bob Hogan and
Five faculty volunteers

Professor Kishimoto's two-week architecture camp for high school students is in its fifth year of operation. This excellent program for young people who are in their sophomore or junior year of high school, once again accommodated nearly 30 participants from across the country.

Professor Tai was our representative at the Governor's School for the Humanities at the College of Charleston.

Six of our faculty members give one morning a week to individual meetings with prospective students and their families to provide an introduction to our program, facilities and students.

In addition, we once again have participated in a variety of career day sessions at various high schools throughout the state. We feel this type of public awareness activity is especially important for our professional program.

Foundation

Jane Hurt
Clarence Addison
Birsen Doruk
Jane Hurt
David Detrich
Jim Stockham

Two of our faculty members participated in the interdisciplinary foundation program. This series of four courses at the freshmen level introduces students in design, landscape, art and construction to the principles and elements of design. In addition, we introduce them to the purpose of a university education as a means of establishing an open-minded approach to learning.

To better assimilate those students who wish to change their major to design, we have established a summer program that is a precise mirror of the normal first year but also allows for some experimentation with course work.

Undergraduate Programs

(J. Hurt, B. Doruk)
2 - Harry Harritos
Ray McGill
Bill Tabberson
Marvolyn Alexander
3 - Tom Sammons
Gordon Patterson
Julie Wilkerson
Teoman Doruk
4 - Lynn Craig
Pam Harwood
Bob Eflin
Scott Murff
(Ray Huff, Durham Crout)

As we reported last year, we view the teaching of our undergraduate program as a 1 + 3 system. The first part is our foundation program, and the second part consists of studios 2, 3 and 4 which now we are considering as a cohesive sequence of exercises, projects and events. The faculty in the undergraduate program have adopted a new syllabus that sets the framework for each year around ideas related to the relationship between architecture and our society.

We have continued our vertical studio efforts during the spring semester, this year adopting the theme "Interventions into the Public Realm."

At the fourth year level, the faculty have continued the New Directions Studio by giving it the focus of preservation in architecture. This studio also affords an opportunity for those seniors who will find their careers in fields other than architecture to study various alternatives and prepare in-depth reports and projects in new directions.

The senior exit project fashioned last year has its focus on ideas related to the "institution" in society and has been placed into the first two weeks of the spring semester.

The field trips to major urban centers have been very successful. Second year (Charleston), third year (New York) and fourth year (Chicago) trips have introduced students to the architecture of the city, and they have had the chance to visit with architects in their offices. A modest amount of support for these trips has been made available by the first annual departmental golf outing.

Lynn Craig was elected to the executive board of the AIA/SC and serves as treasurer (1993), president-elect (1994) and president (1996).

Tom Sammons presented a paper at the Livable Cities Conference in Charleston. Pam Harwood and Bill Tabberson presented a paper at the ACSA national meeting in Charleston.

As president of AIA/S, Joel Goff continued to increase the membership of the organization, which provided programs and activities throughout the school year. The most notable of these programs was our third annual graphics workshop, which brought Steven Oles, a nationally recognized architectural delineator, to campus for a full-day workshop. Professor Harritos helped to organize this as well as serving as AIA/S faculty adviser.

Charleston

Ray Huff, director
Durham Crout

The Charleston Studio continues to provide a forum for our discussion of expectations and consistently higher standards. The intensity and discipline of the small studio in the magnificent urban setting cannot be matched in the bigger arena of the University.

Professor Durham Crout participated in a juried exhibition of installed works in San Francisco. The Charleston program continues to provide an opportunity for a bimonthly casual gathering of architects and students at the Tuesday night lecture/film series.

Post-Baccalaureate

The number of applicants continues to grow for this program, and we have been able to bring in nine students with extraordinary qualifications.

Students in the post baccalaureate program will spend one to two years making up deficiencies before applying for a position in the two-year master of architecture program.

Professor Dale Hutton has been working to improve the status of post-baccalaureate students by arranging to have their courses taught at graduate level and by arranging full graduate status for the purpose of assessing tuition and fees.

Genoa

Cesare Fera, director
Rob Silance

We have established a clear focus for the Genoa program that includes a series of issues surrounding urbanism, the public square and the architecture of the city. Studies in architectural history, current issues in European architecture and elaborate field studies are complementary to the studio project work.

Rob Silance has extended the range of design issues brought to the discussion by including product and furniture design in the contemporary architecture seminar.

Visiting European architects complement the interests of Rob Silance and Dr. Fera by presenting to the students, not only what they do, but also how they go about doing it within the European methods of design and construction. This year's visitors include Severio Fera (from Studio Fera), the Milanese architect and critic Alessandro Rocca, and English architect David Owers.

Master of Architecture and Health

David Allison, director

Professor Allison's approach has been to combine the traditional strengths of this program with one that establishes stronger links with other faculty and departments within the college.

As a member of the AIA/AHA Committee on Health, Professor Allison has helped many of his students receive significant grants for their thesis work. Dina Battisto presented her innovative work on gerontology to the national AIA meeting.

Master of Architecture

Peter Lee, director
Yuji Kishimoto
Joe Burton
Rob Miller
Matthew Rice

The overall quality of thesis work in the master of architecture program continues to improve. In the selection, exploration and resolution of individually sponsored theses, the students have produced a most remarkably varied set of ideas. Most of the committees were interdisciplinary in nature, often including a variety of members from all parts of the campus as well as professionals from the region.

The NAAB visiting team identified a number of issues for us to address during the next five-year period.

- Provide a better integration of technology in design studios;
- Work to appoint a woman faculty member within the graduate studios; and
- Provide a clear, programmatic relationship between undergraduate and graduate study.

We already are working on these issues as we chart a fresh course for 1996.

Our graduate studios have renewed their commitment to public service. Studios tackled projects in West Greenville (Westside Study; Studio Lee) and Columbia (State Museum; Studio Burton).

One of our first-year students, Daniel Harding, working under the direction of Professor Matthew Rice, placed second in an international design competition for a place to study the use of masonry in Maine.

Dr. Joe Burton served on a panel for the ACSA Southeast Regional Conference in Savannah. Matthew Rice presented two papers at regional meetings of ACSA.

Professor Peter Lee has been away on a Fulbright Fellowship as a senior lecturer teaching in Amman, Jordan.

Master of Science

Martin Davis

This new program which is just completing its third year of operation now has two students working on research areas including energy and computer application.

Professor Davis has provided coordination for these programs, initiating new courses in research methods in addition to writing research proposals and grant applications.

It is our feeling that the master of science program will offer opportunities for real inroads for research into the science of our profession.

Remarks

A variety of our faculty members are active in professional organizations and organizations related to their specific areas of interest. We are very proud of these alliances that keep us in constant touch with other members of our field. Of particular note is Dean Barker's role as president of the Association of Collegiate Schools of Architecture.

As director of membership services for AIA/SC, John Jacques has helped to author an initiative to align AIA and CAF in a coordinated continuing education effort. This has become an exciting program, gathering momentum as a landmark C.E. delivery system.

Art Department

In the summer of 1992 the department initiated its first program for area art educators by offering a course in computer art specifically designed by Sam Wang to meet their needs and requests. The success of this initial course was followed by doubling the program in 1993, and plans are being made to triple the program in 1994. The art department created this summer program as a service to area art teachers with plans to expand the offerings to the entire state.

An additional service this year by the department was an Elderhostel course titled the Act of Creation in which there were three components: one in science, one in religion and one in art. The department used five of its artists/professors to lecture on creativity in art with rewarding results both from participants and lecturers. Cecilia Voelker also conducted an Elderhostel course on the History of Port Quarantines from Biblical times to Ellis Island.

The Governor's School for the Arts always has enjoyed a strong relationship both with our Art Department and our College of Architecture with the participation of many of our faculty as teachers in the summer program. The Art Department sponsored an annual outreach program in which 200 area high school students were introduced to the summer program.

The 1992-93 visiting artists/lecturers program included:

- Judy Barber, painter and presently director of the Hambidge Center for Creativity, Rabun Gap, Ga.
- Ken Bloom, writer, critic, photographer and presently director of Spirit Square, Charlotte, N.C.
- Sharon Brixley, technology artist, M.I.T. graduate, presently on the art faculty, University of Kentucky.
- Maggie MacMahon, artist, professor of art at University of Tennessee, Chattanooga; Clemson MFA graduate.
- Roger Manley, curator and photographer specializing in outsider art, Durham, N.C.
- Lorran Meares, nationally recognized photographer, including 1993 Sierra Club calendar, Omaha, Neb.

- Janet Neuwallner, nationally recognized clay artist presently on the art faculty, University of Kentucky.
- Jeanee Redmond, nationally recognized ceramic artist and teacher, Boston, Mass.; Clemson MFA graduate.
- Virginia Scotchie, nationally recognized ceramic sculptor presently on the art faculty at the University of South Carolina.

Highlights of creative work/research by the faculty of the Art Department in 1992-93:

- Syd Cross, one person exhibition of sabbatical leave creative work in painting and printmaking, Lee Hall Gallery; exhibitions in Greenville, S.C., North Carolina, Georgia, New York state and Arizona.
- Tom Dimond, one person exhibition of recent painting at Francis Marion University, Florence, S.C.
- Mike Vatalaro, recent ceramic sculpture selected for national exhibition in San Angelo, Texas.
- Cecilia Voelker, research published in the *Catalogue of the Genova Exhibition*, Genova, Italy; visiting lecturer at Southern Methodist University and the University of Dallas, Texas.
- Gerald Walker, presented a paper at the Association of Collegiate Schools of Architecture national conference titled "Descartes' Elimination of the Category of Final Cause — Its Impact on Modern Architecture."
- Sam Wang, photographer, published in the *Pinhole Journal* and photographs placed in the permanent collection of NationsBank and S.C. National Bank.

Department of Construction Science and Management

During the past year the following research/educational development projects were completed:

- John Mumford completed the development of a Canadian supplement and national standardized examination for the National Association of Women in Construction CIT program.
- Roger Liska completed the construction safety research project which was sponsored by the Construction Industry Institute. The products of the study, including a videotape outlining five techniques which, if implemented in a quality manner, have the potential of resulting in a zero injury project.
- The funded Construction Industry Workforce Foundation study on construction training also was completed. Kirk Bingenheimer, Roger Liska and Andrew Rogers, a graduate student in the program, conducted the study. The study showed the level of training at all personnel levels in the construction industry is increasing. And those who are effectively training invest an average of 2.5 to 3.0 percent of their payroll in this activity. The major benefits realized by those who train were found to be as follows:
 - Average rate of return on investment 2:1
 - Average increase in productivity of 18 percent
 - Average reduction in employee turnover of 18 percent
- Gregg Corley and Kirk Bingenheimer completed the development of an estimating educational program for the National Association of Home Builders, Home Builders Institute. The program is designed for home builders and remodelers.

- John Mumford completed his two funded research projects relating to improving student understanding of structural behavior and the development of a course pertaining to the relationship between technical and design disciplines.

New projects started during the past year and still in progress include the following:

- Assisting Becon Construction Co. in the development of a journeyperson craft certification program for Becon's craftworkers.
- Developing a modularized project management training program for Fluor Daniel, Inc. of Greenville, S.C.
- Conducting a research project to study the existing educational activities of the Carolinas AGC and recommend an employee, career-centered, comprehensive education/training program which will meet their members' needs.

Service and Outreach Activities

The department continued to facilitate the ABC Academies during the past year by conducting five supervisor, four project manager, two safety, one estimator and one executive management academies. The department will continue to work with ABC in providing education and training to construction personnel.

Faculty and Staff Activities

The 1992-93 school year saw the faculty and staff involved in many activities. Kirk Bingenheimer became a tenured-track assistant professor; Chris Piper returned to the construction industry; Angie King accepted a position with Oconee Memorial Hospital, and Michelle King was employed; and finally, David Egan is on a full-time sabbatical during the 1993-94 school year. Professor Egan will be working on various activities related to his teaching responsibilities.

Clarence Addison taught first-year design classes, structures and the first CSM 100, Introduction to Construction Science and Management course. He attended the ASC regional meeting in St. Augustine, Fla., and A/E/C meeting in Dallas, Texas. He presently is working on the development of a series of self-help videos on topics relating to structures, which will be available to students needing extra help on the respective subjects. Finally, Professor Addison served as faculty co-adviser for our chapter of Sigma Lambda Chi and was a member of the following University and college committees: Department Peer Review Committee, College Minority Taskforce and College Gallery Advisory Committee.

Kirk Bingenheimer taught classes in estimating and scheduling and assisted with the laboratory component of CSM 100. He attended a construction estimating seminar in Memphis, Tenn., a planning and scheduling workshop in Clemson, the Construction Leadership Conference in Washington, D.C., a communications workshop and a technology in the classroom seminar in Clemson. Professor Bingenheimer continued to serve as secretary of the S.C. Piedmont Chapter of AIC and took the leadership role in the department to facilitate the ABC Academies and Carolinas AGC Supervisor Institute. He also taught in the Academies along with a competent person OSHA workshop. Besides the research previously cited in which Kirk was involved during the year, he also has been active in developing proposals for funding of various construction-related projects.

Norman Book taught courses in structures and formwork and concrete mix design. He also made preparations to teach David Egan's classes while David is on sabbatical. During the year Professor Book attended a communications workshop on campus, an AISC seminar on structural connections and a series of teleconferences dealing with the environment. He also served on the University Bookstore Committee, chaired the Department Peer Review Committee and served on the College Peer Review Representatives Committee and College Nomination Committee. He also was faculty co-adviser of Sigma Lambda Chi. Finally, Norman de-

veloped a number of units of instructional material on structural systems which will be used to assist students to understand basic structural concepts and behavior.

Gregg Corley taught courses in structures, project management and the capstone class. He attended many seminars and workshops during the year including the annual ABC meeting in Las Vegas, Nev., A/E/C Meeting in Dallas, Texas, ASC annual meeting in Estes Park, Colo., technology in the classroom seminar in Clemson, and local meetings of the PMI. Professor Corley served as chair of the ASC Microcomputer Committee, department representative to the college Computer Committee, member of the McClure Endowment Selection Committee, and a member of the college Time Management Quality Initiative Committee. He also served as faculty adviser to the ABC Student Chapter. In this role he was instrumental in having the national Student Chapter of the Year award given to Clemson's chapter. Professor Corley was elected as a national director (SSE Region) of the ASC. He instructed in most of the ABC Academies and Carolinas AGC Supervisor Institute. Among his other service activities, he was guest speaker at the Charleston Contractors' Association annual scholarship awards dinner, assisted in the NAHB student competition, and facilitated the department's annual golf tournament. Besides those research and educational material development activities previously mentioned, Gregg also continues to be involved in developing additional funding proposals and papers on construction topics for possible presentation and publication.

David Egan taught the department's CSM 304 and 403 courses. He attended the fall meeting of the Acoustical Society of America and the annual meeting of the Canadian Acoustical Association. Professor Egan is a member of 11 professional associations and active in many of them. He continues to be a reviewer on architectural acoustics for the *Journal of the Acoustical Society of America*, national coordinator for the Robert B. Newman Student Award Fund, and associate editor of *Noise/News*, the publication of the Institute of Noise Control Engineering. Finally, he has presented papers on the subject of acoustics.

John Mumford taught courses in structures, materials and methods, and construction documents. He attended a communications workshop on campus, the 1992 ACSA Construction Materials and Technology Institute in Savannah, Ga., and the 1993 Regional Meeting of ASC. Professor Mumford was elected to the board of directors of the local chapter of the National Chapter of Homebuilders, serves as the faculty adviser to the student chapter of HAHB, and served on the board of directors of the Clemson Development Center. In addition, he served on the University Faculty Senate, College Administrative Council, College Advisory Council, department and college curriculum committees, University Welfare Committee, Faculty Senate Executive Committee, and others. He continued to be a PROACT adviser for the University. He attended the national annual meeting of the NAHB and was instrumental in raising \$3,500 to take a group of students to the meeting to compete in the association's annual student contest. John developed and facilitated the first AGC/Clemson Construction Summer Camp for high school students and arranged for and coordinated the visit of the national president of NAHB to the Clemson campus. Professor Mumford completed the research and educational material development activities previously mentioned and began work on others.

Francis Eubanks taught materials and methods, heavy equipment, construction safety, construction documents and construction economics in the undergraduate program; and project management and personnel management in the graduate program. He attended the annual meeting of the American Institute of Constructors in San Antonio, Texas, and the regional meeting of the Associated Schools of Construction in St. Augustine, Fla. He was elected to a three-year term on the national board of directors of AIC, was named editor of the AIC Journal, and was treasurer of the Piedmont Chapter of AIC. He was the faculty adviser to the Clemson student team to the regional ASC student competition. Under Professor Eubanks' leadership, the team took first place. In addition, Professor Eubanks served as faculty senator representing the college and served on various University, college and department committees. He also was faculty adviser to the student chapter of AIC. He

instructed in professional development workshops for the construction industry and presented a paper at the regional meeting of ASC.

Chris Piper taught undergraduate courses in project management and the capstone class and graduate classes in advanced scheduling and cost analysis. She attended the annual Student Carolinas AGC Conference and participated in its activities. She also participated in the local chapter activities of AIC and PMI and attended meetings of the Construction Industry Cooperative Alliance. She served with Roger Liska as faculty adviser to the Constructors' Guild. Finally Professor Piper was instrumental in obtaining a grant from Fluor Daniel to develop a series of education modules to be used in professional development activities relating to project management at the company.

Reta Hancock continued to coordinate the NAWIC's National Education Foundation CCA Testing Program.

Angie King worked to support all the ABC Academies and the AGC Institute.

Roger Liska taught the graduate program construction research course. In addition, as the adviser to the graduate students, he sat on all the graduate student committees. He also served on two doctoral committees for civil engineering students. He served on many college and University committees and has been named acting associate dean for the college. He continued to be very active with national and international construction-related organizations. He serves on national boards of the American Institute of Constructors, Construction Education Foundation, and the American Council for Construction Education. He was elected senior vice president of AIC, chair of the ACCE Standards Committee, member of the Carolinas AGC Foundation Board, and ACCE representative to the Chartered Institute of Building. He continues to be active with the Construction Industry Workforce Foundation, Construction Industry Institute, Construction Industry Cooperative Alliance, and the Construction Managers Association of America. He has taught many workshops pertaining to total quality management and partnering in the construction industry nationwide. He was editor of the *American Professor Constructor*, the refereed journal of the AIC. Finally, he traveled extensively in fulfilling his many obligations, including a trip to the United Kingdom/Scotland.

Department of Planning Studies

Curriculum and Teaching

In the academic year 1992-93 the department taught 20 regularly scheduled courses. In addition to these, there were several sections of Directed Studies as well as Thesis and Terminal Project Committees for more than 20 students.

	<i>Graduate Credit Hours Generated</i>	<i>Percentage of Total</i>
College	2,051	
Planning Studies	678	33.1
(Graduate School figures)		

Recruitment and Enrollment

Enrollment continued to increase in 1992-93, reaching a high of 60 full-time students last fall. The department plan prepared five years ago set enrollment development as one of the goals. The maximum level envisioned at that time was 50 students as long as the faculty remained the same size. The additional load has strained the resources in the department. Many of our graduate courses, tailored primarily for seminar discussion and interaction, do not work well with large class sizes. Courses that emphasize student projects, such as Site Planning and Urban Design, suffer for lack of time to critique student work in class. Also, the larger number of students involved in preliminary and final thesis work demands a disproportionate amount of time for advisement and thesis review.

In an effort to manage enrollment, the department applied higher admission standards for the fall of 1993. As a result, many candidates who met the stated minimum admission requirements of 1,500 GRE and 2.7 GPR were rejected. In view of a University funding formula that discourages high enrollment, there are no incentives in numbers. The goal of the department is to control enrollment through higher admission standards to maintain a faculty-student ratio no higher than 9-10.

Scholarly Activities

- Kerry Brooks, Jim London, et al., published the refereed article "Analysis and Simulation of Employment and Income Impacts of Infrastructure Investments in a Statewide GIS Framework" in the journal *Computers, Environments and Urban Systems*.

At the 1992 national conference of the Association of Collegiate Schools of Planning held in Columbus, Ohio, last fall:

- Kerry Brooks presented "Examining the Natural System/Policy Interface: An Example Employing Natural Systems, Cadastral and TIGER Data in a GIS Context on John's Island, S.C."
- Kerry Brooks and Jim London presented "Infrastructure Planning in a Statewide Geographic Information System Framework."
- Jim London presented "Solid Waste Management Initiatives and Local Comprehensive Planning Efforts."
- Jose Caban and Bob Bainbridge presented "Urban Design as a Basic Requirement of Planner's Expertise."
- Jose Caban participated on a panel on "Design Issues in the Planning Process."
- Barry Nocks presented "Consensus Building for Indigent Health Care Policy at the State Level."

Student Support and Public Service Positions

In 1992-93 the department provided financial aid to 85 percent of its students. The 51 recipients, from a total enrollment of 60, shared \$300,110 distributed as follows:

19 Graduate assistantships	\$33,000
12 Public service assistantships.....	\$45,280
20 HUD work-study grants.....	\$221,930

In addition, these students received \$55,335 in tuition reduction from the University.

The total amount of \$267,210 in external funds will, in turn, generate \$66,800 in match funding.

The 12 public service positions continued to provide a significant link with local planning agencies in the area. This is seen as a vehicle for work-study experience and as a means of strengthening the department's relations with the professional community.

Professional Activities

- Jose Caban completed a two-year period as chairman of the APA Urban Design and Preservation Division in the spring of 1993. During this period the journal, *Urban Design and Preservation Quarterly*, was published in the department.
- Bob Bainbridge is president of the Palmetto Trust for Historic Preservation.

- Kerry Brooks was appointed by the governor as Clemson University's representative to the state Mapping Advisory Committee.
- Jose Caban is ex-officio member of the S.C. Chapter of the American Planning Association's executive committee. (relations with the chapter continue to be strong; the present and previous four chapter presidents have been Clemson graduates, all of whom hold prominent planning positions throughout the state.)
- The department continues to edit and produce *The Palmetto Planner*, quarterly review of the S.C. Chapter of the American Planning Association.
- In October 1992 the department sponsored the association's annual conference in Clemson with a three-day program that attracted a large number of state professionals.
- Through the efforts of Steve Moon, former assistant librarian of the Gunnin Library, the department has embarked on a process of updating and enlarging the Planning Documents Collection. The improved collection will be available as a professional service to state planners through a lending and research service. A graduate assistant is assigned to this job.
- Jose Caban is chairman of the Board of Building Appeals for the city of Clemson and member of the Downtown Revitalization Committee.
- Jose Caban was appointed APA representative to the Council on Tall Buildings and the Urban Habitat.

Accreditation of the MCRP Program

A site visit took place in the spring semester followed by a team report to the Planning Accreditation Board. Both the visit and the report were very positive and complementary of the progress and direction of the program. In their exit interview, the site visit team stated that the program now is "positioned to be one of national prominence." Jose Caban will appear before the Planning Accreditation Board in Philadelphia in October.

Research and Public Service

Sem.	Project Title	Client	Short Description of Project	Funding
Summer 92	Geographic Information System Development	CAF McClure Endowment	Develop innovative GIS techniques	\$2,900
Fall 1992 (Brooks, London)	Tri-County Solid Waste Management Plan	Upper Savannah COG	June 92 - Sept. 92	\$8,930
Fall 1992 (Nocks)	National Initiative for Rural Development	National Rural Economic Dev Institute	Provide strategic planning assistance to state rural development councils	N/A
1992- 93 (London)	Industrial Energy Utilization and Greenhouse Gas Emissions in China	Global Environment Facility/World Bank	Sept. 92 - Dec. 93	\$54,000
Fall 1992 (Bainbridge)	Site Plans for Bagwell Properties, Clemson, S.C.	Dr. Benson Bagwell	Sub-division, multi-family, and commercial development plans and models. Sept-Dec. 93	N/A
Fall 1992 (Caban)	A Civic Center for Blacksburg, Va.	National Competition Project	Urban design proposals to develop a new civic center incorporating existing and future public facilities	----
Fall 1992 (Brooks Nocks)	Chapin Comprehensive Planning Project	Town of Chapin	Sept. 92 - Dec. 92	\$2,500

Sem.	Project Title	Client	Short Description of Project	Funding
Sp/Fall 1993 (Bainbridge, Craig, Chamberlain)	Strategic Development Plan for Lower Richland County	Sunrise Foundation of Lower Richland	Visual inventory, scenic entryways visitor information center, landscape conservation industrial park & development strategy	\$35,000
Spring 1993 (Bainbridge)	Historic Buildings Survey	City of Clemson	Identify and document structures potentially eligible for listing on the National Register of Historic Places	\$1,200 (Proposed)
Spring 1993 (Brooks)	Enhancement of Graduate and Faculty Geographic Information Systems	Clemson University	New equipment and special workshops	\$33,552
Summer 1993	Analysis of County-Seat Travel Times	S.C. State University Ag Econ Department/ Extension	Provide analysis and data (GIS-based)	\$2,500
Summer 1993	GIS Analysis/Modeling of Wildlife Habitat	Westinghouse Savannah River Site	GIS support of environmental toxicology modeling	\$50,000 (Brooks 3800)
Summer 1993/1994	Assessment of Urban-Rural Economic Linkages	USDA/NRI Initiative with M. Henry/ D. Barkley, Applied Economics	2-year analysis of relationships between rural communities and urban areas	\$125,000 (Brooks, 17,000)
Fall 1993 (Caban Yilmaz)	Study of Development Options for the Neck Area of the Charleston Peninsula	Charleston Planning Department	Analysis of trends and conditions and development alternatives for land use and activities	N/A

Landscape Architecture Program

Program Milestones and Notes

The landscape architecture program has graduated its first class of 15 students, completed its first accreditation visit and eagerly awaits official notification that it is an accredited program. With accreditation there is no lull, previous initiatives are ongoing, and both students and faculty continue to initiate new ones. The resulting program visibility by these activities promoted growth and status as well as presented a healthy corpus for the assessment process by the the Landscape Architecture Accreditation Board.

The landscape architecture program occupied for the first time a "stand-alone" studio space for the "professional year" students in the "graduate" side of Lee Hall. This posture will be even stronger for the coming year as we move down one floor in the annex to be on the same level as the other "thesis" year students in the Architecture program. We plan to cement our place in the annex by adding a fall semester studio to the program that will be open to students in architecture and planning. This studio will become the focus of our public service efforts.

The landscape architecture program continues to be visible at Honors and Awards Day by recognition of outstanding achievements by third-year, fourth-year, and rising fifth-year students. The third-year award, known as the Faculty Award, is supported by funds contributed by program faculty members; the fourth-year award, named the S.C. Chapter, American Society of Landscape Architects Award, is supported by the chapter and pays the expenses of a rising fifth-year student to attend the American Society of Landscape Architects annual meeting; the professional year awards continue to be the Webel Prize for study in Genoa, the Marvin Fellowship for study in Genoa, and the \$1,000 CAF Scholarship established earlier for each of the college programs. State professionals continue to assist us in making decisions regarding award recipients.

Fall of '93 has the program in excess of 60 students. This number needs to rise by 10 to 12 students during the next few years and should as we learn more about recruiting, accepting and retaining students. It is imperative that we accept students who have landscape architecture as their first choice and not their second choice.

Students and faculty continue to be active in the American Society of Landscape Architects as participants at the annual meetings at both the state and national level.

The program had the first stand-alone showing of the work by its students in the Rudolph E. Lee Gallery in conjunction with the LAAB accreditation visit.

Scott Sonnenberg continued to assist the program as an adjunct professor, teaching a course in landscape architecture technology.

Carol Johnson and Diana Balmori, both internationally renowned landscape architects, were scheduled to speak at Clemson as a part of the CAF Lecture Series last year, but canceled due to health reasons. They will be rescheduled at a future date.

The landscape architecture program lost Ms. Marvolyn Alexander as a faculty member, as she was unable to continue as a student in the City and Regional Planning Program.

Significant Faculty Accomplishments

- Professor Chamberlain continues to serve on the editorial review board of the *Journal of Architectural Education*. Her contacts with some of the leading theoreticians in architecture have made a significant contribution to the visibility of our program. Professor Chamberlain successfully completed her stint as head of the Clemson Architecture Foundation Lecture Series.
- Professor Tai has been reappointed for the third straight year to a faculty summer position at the Governor's School for the Sciences at the College of Charleston. She teaches gifted students in the area of environmental awareness.
- Professors Collins and Chamberlain represented the University at the annual meeting of the Council of Educators in Landscape Architecture held at the University of Virginia. Professor Chamberlain presented two papers at the conference.
- Professor Collins represented the program at the "chairs meeting" held in conjunction with the American Society of Landscape Architects' annual meeting.
- Professors Chamberlain and Tai were reappointed to their tenure-track positions, Professor Chamberlain for her fifth year and Professor Tai for her sixth and penultimate year.
- Professor Collins, as a public service commitment, continued to serve as a captain with the University Fire Department. Professor Collins designed an innovative fire engine for the department, and it is in service. He has designed a second unit that is under construction in Wisconsin. A third unit currently is being designed for the department. Professor Collins presented a seminar for the Fire Industry Equipment Research Organization on Fire Apparatus Specification and a seminar for the Southeastern Fire School on Programming Issues in Fire Station Design and Location.
- Professor Collins completed the renovation of College Avenue in the city of Clemson and the Shoppes of College Place. Professor Collins (with Professor Harry Harritos, Architectural Studies Department) also completed work on the Keowee Key Fire Station.

Significant Student Accomplishments

The Clemson Student Chapter of the American Society of Landscape Architects continues to receive official recognition from the Office of Student Government. Budget restrictions prevented Clemson students from attending the LABASH conference at Cal Poly. (This is the first time our program has not been represented

since the advent of stand-alone studios.) The student leadership is working hard to see that students will be in attendance at the LABASH program this coming spring.

Matt Compton, B.L.A. May '93, was awarded a B.S. in CSM in August '93. Robert Anderson (B.S. Design, Landscape Architecture '91) received the Master of Landscape Architecture degree from N.C. State University in May '93 and also was awarded that programs top ASLA award. Several students completed the program with distinction on the diplomas. Julia Barham received Calhoun College Honors recognition.

Clemson did not award an Honor Certificate to anyone in the first graduating class, but did award certificates of merit to Laurel Holtzapple, Matt Compton, Jenny Lefort and Chris Watson.

Students completed funded public service projects for Lexington, Atlantic Beach, Westminster, Newport and Limestone College. In addition, they used public entities to complete projects for Charleston County, Abbeville, Beaufort and Piedmont, as well as Front Royal, Va., and Saint Charles, Ill.

COLLEGE OF COMMERCE AND INDUSTRY

School of Accountancy

The School of Accountancy had several significant achievements during 1992-93. Several accomplishments by our faculty and students are worthy of mention, as well as the individual success of our director. Also, the freshmen completed the first year of our new undergraduate curriculum which had been revised the previous year to respond to the recommendations of the Accounting Education Change Commission. The commission had, in turn, previously responded to the broader needs facing the accounting profession. Development is continuing on course revisions as they come online with the revised curriculum. Several faculty members spent a substantial amount of time during the summer preparing for two of the new courses.

Student activities continued strong during the year with the honorary accounting fraternity, Beta Alpha Psi, achieving national recognition as a superior chapter. This marks the second year in a row of being a top-ranked chapter. This recognition carries with it two \$500 scholarships awarded by the international accounting firm of KPMG Peat Marwick. The Accounting Club also had a successful year with professional meetings held monthly in addition to several social events. Both student organizations held meetings dealing with recruiting, an especially important topic during the current economic slowdown. While overall student placement was down slightly from the prior year, the quality of placement remained high with several students getting jobs with international CPA firms and large corporations. Also, a record number of our undergraduate students enrolled in our master's program in accountancy. The average enrollment for the year was 518 undergraduates and 51 master's students. For the year we awarded 117 B.S. degrees and 28 M.P.Acc. degrees.

The internal auditing program continues to attract industry with its internship program. A record number of 17 students had internships during the year, and their placement upon graduation continued to increase.

Faculty scholarship continued to improve with numerous papers presented at professional meetings at both the regional and national levels. Published manuscripts ranged between articles on ethics to internal auditing and taxation. One new textbook was published during the year with two others being revised for newer editions. A national award was received by Professor G. Thomas Friedlob as the Institute of Internal Auditing's Educator of the Year. Professor James A. Turner,

Jr., was recognized as the Outstanding Accountancy Teacher as selected by the school's Student Advisory Council.

Service by the faculty and the school as a whole continued strong. Several faculty members held positions on college and University committees, and one served in the faculty senate. In the professional area, numerous positions were held in the various accounting organizations. Some were at the local chapter level while others were at the regional and national levels. Also, several faculty members gave speeches before their colleagues and accounting practitioners at professional association meetings.

Department of Economics

During the academic year 1992-93, members of the Department of Economics continued their efforts to increase outside funding for the department's activities. These efforts resulted in the department activities being partly funded by grants and other aid from the National Science Foundation, the Department of Defense, U.S.A.I.D., the Earhart Foundation and E.I. du Pont.

One of the department's ongoing sources of funds is due to a gift that funds a trip to Washington for graduating seniors in economics and an outstanding scholar's visit to Clemson. In spring 1993 the department was fortunate enough to entice a distinguished economist, Armen Alchian, emeritus professor of economics at UCLA, to visit. During his four days at Clemson, Professor Alchian visited with students and gave a talk at a dinner for economics majors. All reports indicate that the graduating seniors in economics found his visit informative and entertaining.

To improve our undergraduate offerings to majors, ground was laid for a complete revamping of the undergraduate program to make an economics major at Clemson both more rigorous and more attractive. The major changes are the elimination of many superfluous requirements and an upgrading in the level of the courses taken for the major. We expect the improvements will go into effect next year.

The department continues its emphasis on high-quality research published in leading economics journals. This recognition comes in many forms, including publications, presentations at professional meetings and editorial duties. Among other journals, papers by faculty members appeared in the *Economic Journal*, the *Journal of Finance*, the *Journal of Labor Economics*, and the *Journal of Business*. As in prior years, the department improves each year. Perhaps the most notable event in the past year was the inclusion of two faculty, Michael Maloney and Robert McCormick, on the editorial board of a new journal, *Corporate Finance*. Research by these faculty members focuses on the modern theory of the firm, one of the issues addressed by papers in the journal.

Department of Finance

The Department of Finance continued to be among the nation's leaders in undergraduate finance education in 1992-93. Last year marked the inaugural year of our financial communication training program, funded by a \$500,000 grant from NationsBank. Financial management graduates continue to take a more rigorous program of accounting and finance courses than students in finance programs at any other university. According to the director of college recruiting for a major national bank, Clemson ranks among the top five in the country in the technical training its students receive.

In the area of private financial support, Buck and Anne Breazeale pledged \$250,000 to establish the Thomas C. and Anne Breazeale, Jr., Professorship in Financial Planning. John Cote, vice president of Waccamaw Pottery, Inc., committed funds to establish the annual Cote Fellow award for finance faculty. This award will recognize, in alternate years, faculty achievement in teaching and research.

Finance faculty have generated research publications that have appeared in the top journals of the field during the last year. Findings of their studies have far-reaching applications to world financial issues ranging between international takeovers and capitalization standards for financial institutions.

Professor Mike Spivey says the best bet for a quick recovery for undercapitalized banks is to issue equity (as opposed to downsizing, cutting dividends or trying to sell the bank). Professor Neil Waller has studied lender forbearance in the mortgage market and finds the equity position of the borrower affects the foreclosure decision.

Several professors have studied the role boards of directors play in building firm value. For example, joining the board of another company lowers the value of a director's own company, according to a recent study by Professor Stuart Rosenstein. He also has found that banks which acquire other banks do worse as the proportion of outside directors on the board increases.

By contrast, "outsiders" on the board in general tend to increase firm value, according to Professors Wayne Marr and Scott Barnhart. They find firm value increases when either managers own more of the firm's stock or more outsiders serve on the board. The two professors were interviewed by *Forbes* magazine as a result of their study.

Professor Uma Sridharan explains what determines CEO salary levels in a recent paper, and she identifies the determinants of the form of corporate control contests in a separate paper. In another corporate study, Professor Jim Miller shows managers don't exploit inside information when buying back their firm's stock.

Contrary to popular opinion, foreign takeovers are not detrimental to domestic firms' value, according to Professors Mike Spivey and Wayne Marr. Their research study will be published in a new book on corporate takeovers. Another new finding shows Japanese investors really do think "long term" as popular opinion has suggested, according to Dr. Yong-Cheol Kim. He finds stock prices of Japanese companies go up when they issue Eurobonds.

Investors benefit from buying on the unexpected earnings of those firms not followed by analysts, according to Professor Alexander who also was one of the first to document a declining benefit for investors who buy *after* the earnings announcement.

Professor Scott Barnhart finds soybean future prices escalated when one company tried to corner the market. Prices declined sharply when the commodities exchange forced the manipulators to sell their holdings. Yet despite the temporary drop in prices, the order to liquidate did not have a lasting effect on the soybean market.

Professor Alexander and Department Head Rod Mabry evaluated all finance journals, authors and articles to determine the most effective contributors to top-level research. Their paper will appear in the *Journal of Finance*. Dr. Mabry also co-authored *Economics 2e*, with Dr. Holly Ulbrich. Professor John Harris wrote *International Finance*, published by Barron's, which is an overview of international finance for business managers and bankers. Mary Dehner, who directs the NationsBank Communication Initiative for the department, wrote *How to Move from College into a Secure Job*, which is published by NTC Publishing and is due out this fall.

Department of Legal Studies

The Department of Legal Studies, formed in July 1992, was transformed to the Legal Studies Group of the Department of Finance in July 1993. In its first year of operation, the department continued its fundamental mission of teaching law and policy courses that are required of many undergraduate and graduate students. In addition, faculty in the department offered new courses to meet the demands of other departments and extended the department's service and research missions.

Highlights of the year include:

- The first offering of a course in environmental law and policy.
- Faculty sponsorship and participation in a national program on the North American Free Trade Agreement (NAFTA) for 25 U.S. Senate and House staffers.
- Faculty participation in two Washington conferences, one on land law, the other on hazardous waste management.
- Two faculty featured in an article in *Forbes* magazine.
- Presentations by faculty to members of the state Land Resources Commission, the S.C. Agriculture Council, and participation of one faculty member as a member of the state Board of Economic Advisers.
- More than a dozen radio/newspaper/TV interviews of faculty.
- Faculty publication of two law textbooks, one book on environmental policy, chapters in a book on NAFTA, a publication on the status of pollution permit trading in the United States, and four articles in professional journals.
- The faculty gained financial support for research and student activities from the American Farm Bureau Federation and the Scaife Foundation.

Department of Management

The Department of Management, under the leadership of Dr. William H. Hendrix, department head, continued to position itself for the 1990s. The department continued its academic total quality management efforts begun in the 1990-91 academic year with development of a departmental strategic plan. Faculty developed the plan based on the vision statement created during 1990. During the 1991-92 academic year departmental strengths and weaknesses were determined, broad goals were established, followed by the formation of specific objectives. These served as a basis for actions taken during the past academic year. The broad goals for the future include:

- improving academic programs and classroom instruction,
- improving the quality of our incoming and outgoing students,
- improving our reputation with the business community,
- improving our reputation among academic and professional institutions, and
- increasing the quantity and quality of research.

Goal one continued to serve the faculty in improving our academic programs. Toward this end the curriculum committee and the department faculty at large developed a new undergraduate curriculum designed to better serve students and industry working locally, nationally and in the international arena. This was accomplished while restructuring the curriculum to meet the new AACSB guidelines for accreditation. A conceptual approach for restructuring the M.S. in Industrial Management program was developed and presented to the faculty. The faculty supported this approach, and a committee will be working on this restructuring during this year. In support of goals one and three, Dr. LaForge upgraded the application software in the Manufacturing Management Laboratory to the latest releases of MAPICS, Factor and Jobscope. This keeps Clemson students on the leading edge of information technology for managing production operations. Dr. Lipp received equipment to develop a Group Support Systems Laboratory, and Wunda Weave has agreed to donate carpet while another textile company has agreed to provide decorating services and draperies.

The second goal in the strategic plan resulted in a revision of our department's brochure describing our academic programs. This brochure has been used for recruiting and will serve in the future as a major document for recruiting. Policy revisions have been started to address how we can attract and screen students, resulting

in a higher quality student group majoring in programs within the department. Also in support of this goal were actions resulting in the receipt of two student scholarships by our students in logistics/transportation. One was a national award (one of only 10 awarded nationally) and the other a local award.

The third goal in the strategic plan led to success in internal and external funding received by the department. This included funding received by: (a) Dr. Phil Roth, who received \$875 from the Undergraduate Studies Office to purchase a camcorder for the department, (b) Dr. V Sridharan and Jack Kanet, who received a research grant for \$40,000 from McDonnell Douglas Space Systems Co. for their on-going research concerning "Tactically Delayed Scheduling"; \$92,000 National Science Foundation research grant for Deterministic Order Release Planning research; \$16,000 in pledges from NCR Computers, McDonnell Douglas Space Systems Co., Robert Bosch Corp., AHP Havermann & Partner, and the NSF for a workshop on "Manufacturing Logistics" held in Clemson March 5-6, 1993; \$40,000 research grant from NCR Computers for their research on Computer Integrated Manufacturing Logistics; a 386 PC with two SVGA monitors donated by and valued at \$7,200 by NCR Computers for their research on Computer Integrated Manufacturing Logistics; a grant of \$14,000 from NSF for a workshop on Manufacturing Logistics scheduled October 8-9, 1993; \$65,000 software donation from AHP Havermann, Inc., and (c) H. Soroush, who received a \$15,000 grant from the board of directors of Project Management Institute (PMI) to develop a course in project management for spring 1994. The PMI also approved the request for establishing corporate interactions including co-op, internships and fellowships for PMI students — full financial support (\$7,329) and partial support of at least 15 percent of the cost of course instruction (\$8,303). The department received an \$11,780 gift from Metrscope of SPC software and hardware for classroom demonstrations and for starting an SPC laboratory. Dr. Hendrix chaired the 21st Century Excellence Award Committee sponsored by the college's Professional Development Department, and this committee selected Wilson Sporting Goods as this year's winner. The award was presented in New Orleans in May during the annual conference on organizational excellence. Also in support of goal three was the success by the department in placing logistics/transportation students in jobs in a very tight job market. At least 10 students were hired as transportation managers. To date, 18 logistics/transportation students have successfully completed internships with industry, and 10 additional currently are interning at five companies. In support of this goal, and goals one and three, was Dr. Grigsby's casebook, *Strategic Management Cases*, published by Wadsworth Publishing Co. Dr. Leap had published a book that is extremely timely and focuses on a very important issue: *Tenure, Discrimination and the Courts* (ILR Press).

The fourth goal in the strategic plan was supported by our faculty being recognized both internally and externally. Dr. Roth was promoted to associate professor and Dr. Sridharan was granted tenure. Dr. Davis received the Faculty Adviser of the Year Award from the central office of the International Fraternity of Delta Sigma Pi. In line with goal four, a number of our faculty served on editorial review boards for professional journals. These included Dr. Sridharan and Dr. Larry LaForge. Dr. Sridharan served on the *Journal of Operations Management*, *Production and Operations Management*, and as editor of the *OMA Newsletter*. Dr. LaForge served on the editorial review boards of the *Journal of Operations Management*, *Computers and Operations Research*, and *Production and Inventory Management Journal*. Other faculty serving as reviewers for professional journals included: Professors Summers, Crino, Davis, Lipp, Roth, Hendrix, LaForge, Leap, St. John and Butler. Dr. LaForge won the 1993 Teaching Excellence Award from the Academy of Business Administration. To improve our overall operation while absorbing the loss of one staff, the administrative staff for the front office was reorganized. This reorganization clarified the responsibilities for budget, personnel actions, secretarial support, and academic and research support.

Lastly, in line with the fifth broad goal, research contributions by management faculty appeared or were accepted for publishing in some of the best journals in the field, including *Journal of Management*, *Strategic Management Journal*, *Production and Inventory Management Journal*, *Transportation Journal*, *International Journal of Purchasing and Materials Management*, *Operations Research*, *Journal of Organizational Development*, *Production, Planning and Control*, *Journal of Business and Psychology*, *Organizational Behavior and Human Decision Processes*, *Journal of Applied Psychology*, and *Journal of Managerial Finance*.

Department of Marketing

During the 1992-93 academic year 146 students graduated with B.S. degrees in Marketing. Although our enrollment has declined, marketing continues to be a popular major for undergraduates. The department presently has approximately 400 majors, making it the seventh largest department in the University. Additionally, the department also serves approximately 550 students who are minoring in marketing.

Three years ago, the Marketing Department revised its curriculum and adopted a niche strategy. The department now offers its majors the option of having a concentration in one of the following areas: Technical Marketing, Services Marketing or General Marketing Management. We are in the process of "fine tuning" our curriculum. As a result of discussions with our business constituents, we will, in the near future, require marketing majors to have more communications and international courses. Dow Chemical Co. is continuing to support our technical marketing concentration by giving us a \$1,000 scholarship to be awarded to a deserving student in this area. We have submitted a proposal to the provost for a selling/behavior lab, which if funded, should improve the quality of instruction in a number of our classes. The department continues to work with the Development Office in seeking external support for a chaired professorship in marketing.

The department's publication and research activity was outstanding in 1992-93 despite significant funding reductions which impacted our ability to support faculty research endeavors. The Marketing Department continues to bring recognition to Clemson University by publishing in our discipline's leading scholarly journals. This past academic year the faculty's research was published in the *Journal of Consumer Research*, *Journal of Advertising*, *Journal of Marketing Theory and Practices*, *Journal of Marketing Education*, *Journal of Public Policy and Marketing*, *Journal of Consumer Affairs*, *Journal of the Academy of Marketing Science*, *Journal of Business and Industrial Marketing*, *Journal of Health Care Marketing*, *Journal of Teaching International Business*, *Psychological Reports*, *Journal of International Consumer Marketing*, *Advances in Services Marketing and Management*, *Journal of Non-Profit and Public Sector Marketing*, *Journal of Current Issues and Research in Advertising*, *Journal of Travel and Tourism Marketing*, *Psychology and Marketing*, *Journal of Personal Selling and Sales Management*, and *Journal of Product Innovation Management*. The marketing faculty also presented numerous papers at our most prestigious national and regional conferences including the American Marketing Association conferences, the Association for Consumer Research meeting, the Academy of Marketing Science meeting, the American Advertising Association meeting, the Macromarketing conference, the Services Marketing conference, the Southern Marketing Association conference, the Atlantic Marketing Association conference, the Council on Logistics Management Educators' conference, and the Academy of Business Administration meetings. Almost all the marketing faculty now either serve on the editorial review boards of leading scholarly journals or serve as regular reviewers for these journals; several hold offices in local, regional and national marketing associations. In addition, several faculty received grants from various agencies including the S.C. University Research and Educational Foundation and the S.C. Commission on Higher Education (CHE).

The marketing faculty continues to provide service to the college, University, the discipline and the larger community as well. Two of the three representatives on the Faculty Senate from the College of Commerce and Industry are from Marketing. Marketing faculty serve on numerous University committees including the recently established President's Commission on the Status of Women at Clemson University. Further, faculty undertook numerous studies to assist local and regional organizations including, but not limited to, the Visitors Center, the Greenville Chamber of Commerce, Moore Development Corp., Farmer's Hall, Eastern Distribution, Clemson Tomorrow, Topspin Racquet and Swim Club, and Newton's Shoes.

Master of Business Administration Program

During the 1992-93 academic year the Clemson M.B.A. program received formal approval of one program location, started one new program and laid the groundwork for three additional international program sites in Europe. During this academic year the M.B.A. degree was offered at five different locations: 1) the original evening program located on the campus of Furman University in Greenville, S.C., with approximately 240 students enrolled; 2) the full-time program on the Clemson campus, with 200 students enrolled; 3) the evening program on the campus of Lander University in Greenwood, S.C., (which was formally approved by CHE during the 1992-93 year), with approximately 25 students enrolled; 4) both full-time and part-time programs at Pordenone, Italy, with a combined enrollment of approximately 55 students; and 5) programs in Munich, Germany, where a full-time program was offered for the first time, as well as a continuing part-time program, with a combined enrollment of approximately 30 students. Total enrollment at all locations averaged almost 550 students, and 237 students graduated with the M.B.A. degree during the 1992-93 academic year, including the August 1992, December 1992 and May 1993 graduations.

Entrance standards continued to increase, resulting in the highest averages yet on the standard entrance metrics used as part of the applicant evaluation process, and enrolled students were drawn from more than 30 different countries. In addition, a faculty committee began an intensive review of the M.B.A. curriculum and recommended a complete revision of the curriculum for the full-time program on the Clemson campus, recommending a two-year, lock-step program with fall entrance only. If this new curriculum is fully approved, we anticipate that it will become effective for students entering in the fall of 1994. While it is anticipated that this change initially will result in a decrease in the size of the full-time Clemson campus program, the resulting high-quality, rigorous program should eventually attract top-quality students.

Since the M.B.A. is an interdisciplinary degree, the faculty that teach in the three domestic programs are drawn from Clemson's School of Accountancy and from the Departments of Economics, Financial Management, Management, and Marketing. At the European locations, faculty are drawn primarily from U.S. public universities and colleges which, like Clemson, have AACSB accredited M.B.A. programs, as well as a few faculty from selected European schools. Seven faculty members from Clemson have had the opportunity to teach at one or both of the European locations over the past two years, enhancing both the program and the international expertise of the faculty members involved.

Office of Professional Development

The Office of Professional Development (PD) posted another great enrollment in 1992-93 as it continued its nationwide strategy to offer more conferences and fewer seminars.

More than 17,430 people attended PD-sponsored textile, technical and management conferences, seminars and in-house programs across the country.

The most significant event of the year was the second annual "Organizational Excellence" conference held in New Orleans May 24-26, 1993. More than 620 executives, including 128 company presidents and vice presidents, were on hand, more than doubling the previous year's enrollment. The Alliance for PEOPLE is the umbrella organization designed by PD to spearhead this ground-breaking conference. PEOPLE is an acronym for the Promotion of Excellence in Organizations through Productivity, Leadership and Empowerment.

The conference featured six headline speakers, eight full-day executive briefings and 30 concurrent sessions. Here are just a few of the comments made by conference attendees:

"The entire conference has been very energizing. This is an opportunity for a critical mass of people to play a genuine leadership role in changing and shaping the future. Momentum must be maintained to keep this effort from being just an event. I'm very pleased I attended and look forward to a continuing and growing relationship. Thank You!"

Anthony Penzone, organizational development manager, Digital Equipment Corp., Hudson, Mass.

"An excellent opportunity to hear the theory and practical applications of today's management philosophies."

William F. Everett, vice president, South Bend Controls, Inc., South Bend, Ind.

"Excellent! The best conference I've attended — EVER! For your second year this was a phenomenal undertaking. Congratulations!"

Colleen Kelly Laich, supervisor, Commercial Insurance Training Nationwide Insurance, Columbus, Ohio.

"Again, I can't wait to get home and try to apply what I heard here to my sphere of reality. This is an excellent way to get exposed to the current thoughts of our day and meet with others to share our experiences. I can't wait to come back next year."

Gregory J. Altieri, manager, Program Control E-Systems, Inc., FOS., Springfield, Va.

The keynote speakers were Stephen Covey (author, *The Seven Habits of Highly Effective People, Principle-Centered Leadership*), Joel Barker (author, *Future Edge: Discovering the New Paradigms of Success*), Peter Senge (author, *The Fifth Discipline: The Art and Practice of the Learning Organization*), Sue Miller Hurst (author, *How Human Beings Learn*), Morris Massey (author, *The People Puzzle*), and John Rutledge (economist and co-author, *Rust to Riches*).

At the "Organizational Excellence" conference, President Max Lennon presented the 21st Century Organizational Excellence Award to the Wilson Sporting Goods organization from Humboldt, Tenn. The awards committee included two Malcolm Baldrige Examiners and was chaired by William Hendrix, head of the management department.

Because of the phenomenal success of the previous two conferences, the third annual "Organizational Excellence" already has been scheduled for May 23-25, 1994, at the Harbor Marriott in San Diego, Calif. At this writing, 204 executives have preregistered in anticipation of hearing this stellar line-up of headline speakers: Tom Peters, Joel Barker, Jim Belasco, Jack Stack, Carole Leland, Warren Bennis and Richard Schonberger.

Other highlights from the PD year include:

- The expansion of our technical seminar product line nationwide and its subsequent growth in enrollment, jumping from a little more than 1,500 parti-

cipants in 1991-92 primarily in the Southeast to 3,300 this fiscal year. Topics included industrial barcoding, maintenance management, supplier certification, warehouse operations, using the Baldrige criteria to achieve TQM, custodial staffing and standards, slashing facility costs, and set-up reduction.

- Continued success with textile, technical, apparel and professional development for women conferences and Quality Forum seminars across the country.
- The introduction of a blockbuster conference on Benchmarking High Performance Teams in Orlando in August, which attracted 139 participants — an outstanding enrollment for a first-time conference. A follow-up conference is scheduled in San Francisco, March 17-19, 1994.
- A rise in in-house training programs to 92, serving 1,444 customers in 60 companies with 171 training days.

Small Business Development Center

The Clemson University Regional Small Business Development Center (SBDC) continued to assist the small business community in the 11 Northwest counties of South Carolina. Through its administrative offices located on campus in the College of Commerce and Industry and three area offices located in Greenville, Spartanburg and Greenwood, the SBDC has fostered economic growth and development in the Upstate. For the fiscal year ending December 1993, the Clemson SBDC will assist approximately 1,200 new clients in addition to the existing client base. Trends indicate that the Clemson SBDC operation once again will conclude the year in excess of annual goals. In addition the Management Training Division conducted more than 30 seminars on current and diverse small business management topics.

The center's core program of management assistance and training is funded by the Small Business Administration, the state of South Carolina and Clemson University through the College of Commerce and Industry. The core mission of the SBDC is to promote the growth and development of small businesses by providing management and technical assistance as well as encouraging entrepreneurship. In addition the center administers a Defense Logistics Agency grant for the establishment of a state and federal procurement assistance program for small businesses. As a result of this program now in its sixth year, several large procurement contracts have been awarded to small businesses in the Clemson region. The program also is on the forefront of the subcontracting opportunities for small businesses associated with the BMW project in Greer, S.C.

The Clemson SBDC also is pursuing a training opportunity which would complement the training provided to the Polish and Hungarian SBDC consultants last year. The SBDC has submitted a proposal in conjunction with the Upper Savannah Council of Governments and Palmetto Leadership to provide training in the operation of SBDCs to be housed in Brandenburg, Germany. The Polish and Hungarian centers have been established and are seeing approximately 100 new entrepreneurs per month.

School of Textiles, Fiber and Polymer Science

The 1992-93 academic year was a particularly busy year for the School of Textiles, Fiber and Polymer Science. With second year funding of the National Textile Center and numerous other research contracts, sponsored research exceeded \$2.2 million. Work on these contracts involved 12 faculty and supported approximately 30 graduate students. An additional \$1.2 million in sponsored research was carried out at Clemson Apparel Research (CAR). In addition to the sponsored research, CAR became a part of the Southeast Manufacturing Technology Center and

entered into a production subcontract with Sir Shirt makers to produce shirts for Lands End.

During this year the school graduated one Ph.D. student, three M.S. students and 34 B.S. students. Placement of these graduates continued to be high as in previous years. Enrollment in the undergraduate programs was slightly lower than in previous years with 164 students enrolled in the three undergraduate programs in September 1992. Graduate enrollment increased to 29 as a result of the increased support for assistantships through sponsored research.

We have continued to enhance our laboratories through acquisition of equipment both purchased and donated. This much-needed equipment serves both to increase our research capabilities and to enhance our teaching efforts.

Even with the increased sponsored research activity, our public service commitment was well-supported with more than \$100,000 billed to firms for special testing and small project/consulting efforts by our faculty and staff. Numerous additional consultations were provided by the faculty on a no fee basis.

COLLEGE OF EDUCATION

The three traditional academic pursuits of teaching, research and service were reflected consistently in the accomplishments of the College of Education during the 1992-93 academic year. Measurable and substantial success was evident in a record number of efforts involving grantsmanship, research activities, collaboration with school districts and service activities throughout the state. These efforts were evidence of marked improvement when compared with the previous year not only in terms of numbers, but also in degrees of commitment to the effectiveness of strategic planning, both on a short-term and a long-term basis.

The College of Education comprises the Departments of Elementary and Secondary Education, Industrial Education and the Army and Air Force ROTC programs, as well as the offices of Educational Research, Extension and Public Relations, Field Experiences, and Educational Services and Placement. Their respective summaries of accomplishments during the 1992-93 academic year reflect their unified commitment to the college's priority on program achievement and improvement.

Department of Elementary and Secondary Education

Instruction

The mission statement adopted by the Department of Elementary and Secondary Education includes the following:

- prepare teachers for employment in public and/or private schools,
- provide graduate programs for educators and personnel of community and state agencies,
- engage in public service activities with educational entities and state and community agencies,
- conduct research and scholarly activities related to public and faculty interests.

Departmental faculty have focused on all the areas of teacher preparation, continuing education conducted through graduate degree programs, extension courses, and in-service workshops as well as continued growth in research and scholarly activities. Faculty members have access to network computer equipment and are continuing their efforts to implement computer instruction into methods courses, along

with higher-order thinking skills and strategies for writing-across-the-curriculum program initiatives.

Expansion in the college has continued as reflected in student enrollment figures. There were 1,564 undergraduate students and 1,540 graduate students enrolled for spring. The department continues to serve a very able group of undergraduate and graduate students. The undergraduate students entering the department as part of the class of 1996 have an average SAT score of 982. The strong academic ability of this group also is evidenced by the report that more than 90 percent of them passed the Educational Entrance Examination during their first year at Clemson.

B.A. degrees are offered in early childhood, elementary, secondary and special education. Science teaching and mathematics teaching are additional undergraduate programs granting the B.S. degree. M.Ed. degrees are available in the areas of administration and supervision, counseling and guidance services, elementary education, reading, secondary education and special education. The administration and supervision program has an approved Ed.S. degree program. A Ph.D. in Curriculum and Instruction was implemented in January 1993. Additionally, a Ph.D. in Educational Leadership was recently approved.

The Department of Elementary and Secondary Education continued its commitment to place undergraduate students in practical public classroom experiences. The first course in which education majors observe in the public schools, ED 100, had an enrollment of 497. Foundation and methods courses likewise provided frequent visits arranged for 764 students to experience the classroom environment. The early childhood and elementary field experience courses, ED 400/401, provided 199 undergraduates with similar extended experiences, and ED 496 provided 24 students with special education field experience.

The Special Education program enrolled 54 students (undergraduate and graduate) in practica courses. The guidance and counseling program had 38 elementary and 22 secondary placements, 26 postsecondary placements and 67 community agency placements in practica. Administration and supervision provided practica for 19 students in ED 723 for the elementary principal, 13 students in ED 724 for the secondary principal and 25 students in ED 725, a course for superintendents.

On the current topic of at-risk students, the "Visions for Youth" project, funded by the Kellogg Foundation, continued to provide outreach programs aimed at the prevention of potential dropouts. The Reading Recovery Program centered at Clemson is a research-based approach to providing reading skills for children with identified deficiencies. This program is recognized internationally.

Inservice

The Clemson campus was the site for several educational conferences and meetings. The Clemson Reading Conference attracted more than 350 teacher educators, public school teachers and school administrators from the Southeast. Project L.E.A.D. sponsored a conference to improve leadership skills of school administrators. In a community-based activity, approximately 1,250 fourth graders from Pickens County participated in a Fun and Fitness Classic Day: Ready, Set, Go.

Through the Greenville Higher Education Consortium, faculty taught courses in various programs to area students. Similarly, critical needs and EIA courses were contracted with school districts and funded by the State Department of Education. In regard to local inservices, 52 sessions were conducted for educational personnel in the region.

Research, Grants and Related Activities

Faculty remained active with regard to publications. Eighteen books, chapters or monographs were published by the faculty. Forty-three articles, 38 of which were published in refereed journals, appeared in print. Twenty-two unpublished articles and miscellaneous works also were submitted.

Presentations were conducted at many levels. Faculty presented at 34 national, 19 regional, 36 state and 15 local professional meetings.

Grantsmanship was evidenced by the 28 grants written/co-written. Thirteen of these proposals were funded for a total of \$1,403,600. Several faculty members participated in the development of grants.

Recruitment received notable attention by faculty representatives. Teacher cadet programs continued with five high schools.

Department of Industrial Education

The Department of Industrial Education continued to be a very dynamic unit within the College of Education during the 1992-93 academic year. The department enjoyed great success in addressing its primary mission of delivering quality undergraduate and graduate instruction, while at the same time expanding its efforts in research and public service. The full-time faculty continue to carry a heavy load of teaching, reflected by the fact that of the 18 full-time faculty, all but three are totally funded from instructional funds. The three non-instructional faculty are funded from self-supporting activities centered on industrial training short courses serving the graphic arts industry, but with noted growth in services provided through the PRINTCOM centers in the area of pre-production testing on the Carint Press and the special envelope press.

Teaching has been and continues to be the primary mission of the Industrial Education Department. During the report period the number of students enrolled in Industrial Education undergraduate and graduate courses increased approximately 10 percent (2,860 individual course enrollments). This increase is most notable since the greatest increase resulted from growth in graduate programs offered by the department. The interest in the Master of Human Resource Development degree has been very strong, and that degree now has more than 300 persons admitted or seeking admission to the program. The undergraduate enrollments in all majors have been maintained, with the B.S. in Graphic Communications degree showing growth evidenced by increasing declared majors from 166 ('91-92) to 188 ('92-93), a growth of 13 percent.

The faculty was most active in preparation and submission of grant and research proposals. Six of the faculty received grant awards during the past 12 months in the areas of: Trade and Industrial teacher preservice and in-services courses, Technology Education TechPrep teacher in-service courses, TechPrep Developmental Grant, and Instructional Innovation seminars. The department continues to benefit from close ties with industry liaisons as evidenced by several equipment and supply grants. The graphic communications program received a new screen printing press and several computer work stations to fully operationalize the 'Pre-Press Center,' and continues to receive financial, supply and equipment support for the flexographic research/training facilities. The technology education program received industry donations of equipment and faculty training for a new power technology training simulator.

The Industrial Education Department provided various professional and community service activities during the report period. The faculty and students continue to provide leadership in various professional and preprofessional associations, are active in services to local school and community groups and maintain active participation in industry-sponsored activities. Two of the Industrial Education student organizations received national recognition during the past year. The Technology Education College Club received several awards at its national meeting, and the TAGA chapter was recognized for excellence in student-sponsored research. Several students received awards (certificates and financial) for their class-related projects. This past summer the department hosted the International Graphic Arts Educators' Association's annual convention at Clemson; the participants — representing 39 states and five nations — were unanimous that this was their best convention in recent years.

Department of Aerospace Studies

During the 1992-93 academic year, approximately \$127,682 went to support 25 scholarship holders in the Air Force ROTC program. Ten cadets were commissioned as second lieutenants in the Air Force. Air Force ROTC cadets participated in a number of community and service activities to support and enhance the rich military heritage of the University.

The cadet corps continued to enhance POW/MIA awareness at Clemson with a variety of activities: an all-night vigil in the entrance of Tillman Hall, a public candlelight ceremony at the POW/MIA memorial in Greenville's Cleveland Park; and by co-sponsoring with their counterparts from the University of South Carolina, conducted a relay run of a POW/MIA flag from Clemson to Columbia so it could be flown over the state Capitol. The cadet corps continued its tradition of an enhanced physical fitness and leadership training program in the spring, tailored specifically for sophomores to improve their performance at field training.

The cadet corps teamed with the Arnold Air Society, a fraternal organization of selected Air Force ROTC cadets, and the Angel Flight/Silver Wings, a student service organization, to sponsor a military "dining out" in the fall. In the spring, cadets worked with their Army counterparts to plan and execute the annual Military Ball. Both events featured a general officer as the guest speaker. The Arnold Air Society also sponsored the area conclave for representatives from the same organization representing universities from throughout Georgia and the Carolinas. Based on their past superior performance, both the Arnold Air Society and Angel Flight/Silver Wings organizations were selected to be their respective regional headquarters for the coming year. At the national conclave in 1993, both organizations continued their long tradition of being one of the nation's most active and successful by receiving a national award in addition to several regional awards. Selected cadets continued to participate in other military related organizations including Pershing Rifles, Rangers and Scabbard & Blade.

Department of Military Science

The academic year 1992-93 was filled with highlights for the Department of Military Science (Army ROTC). Fifteen students were commissioned second lieutenants. Fifty-two scholarships were provided by the Army, amounting to \$260,000.

During the fall and spring semesters the Fightin' Tiger Battalion served as ushers for all football and basketball games held at Clemson, as well as numerous concerts and special events. High praise was earned from the participating coaches for this activity.

The department has an outreach program to four local high schools (West Oak, Seneca, Walhalla and Liberty) which sponsor Junior ROTC programs. These schools obtained superior ratings on national inspections during this period. Department organizations (Rangers, Pershing Rifles, Scabbard & Blade) continued their service-oriented projects. The Scabbard & Blade Society hosted the annual Military Ball. Maj. Gen. Paul Blackwell (Clemson Class of '68) was the guest speaker for this formal event. The ROTC junior class hosted a "dining out" involving Col. Ben Skardon, Bataan Death March survivor, as the guest speaker.

The battalion also sponsored an adventure training weekend for area high schools' Junior ROTC programs. More than 200 cadets from six area high schools participated in rappelling from a 90-foot cliff, land navigation in the Clemson Forest, air rifle marksmanship and other exciting outdoor events.

The ROTC cadre working with a professor from the College of Agricultural Sciences developed a state-of-the-art multimedia computer application to enhance cadet recruiting and retention. This innovative concept was endorsed by ROTC

Cadet Command Headquarters in Fort Monroe, Va., which appointed a task force charged with developing and implementing the concept on a national level.

Cadets participated in greatly intensified physical and technical training, as well as leadership enhancement exercises to improve performance at Army summer advanced camp. Of the 19 cadets who attended summer camp, four scored in the top 10 percent in the nation, six in the top 20 percent, while all attendees were top-half performers.

Office of Educational Research

External/Internal Submissions

Thirty-two proposals for external funding and four proposals for internal funding were submitted from the College of Education during the 1992-93 fiscal period. More than half were authored by writing teams of two or more faculty members, with 22 separate faculty serving as principal investigators. Approximately 65 percent of the faculty of the college have been involved during the 1993 fiscal year in the preparation of proposals. This level of participation is up from about 30 percent in 1991.

While the number of proposals submitted during the 1993 fiscal year was slightly less than the number submitted in 1992, the percentage of proposals funded increased. More significantly, the percentage of requested dollars actually obtained was 60 percent. This is a high percentage and reflects very positively on the quality of our recent applications and the positive relationships which faculty are developing with potential sponsors. Most notable among the large funded proposals was the Center for Rural Special Education authored by Dr. Emery and the National Preparation of Personnel for Transition of Youth with Disabilities in Adult Life developed by Dr. Emery.

These faculty efforts are very much appreciated and serve to provide positive visibility among potential sponsors.

Office of Educational Services and Placement

The Office of Educational Services and Placement continues to expand both the scope and breadth of its activities. The sixth annual Clemson University Teacher Interview Program resulted in record numbers of participants, including 80 school districts from six states, 400 student and alumni attendees, and approximately 2,500 interviews. Anderson College and Central Wesleyan College students also were invited to participate.

Workshops and seminars were offered in the fall and spring semesters to all undergraduates, providing information on resume writing and interviewing etiquette and techniques. Student teacher in-service workshops were conducted in the fall and spring semesters for graduating seniors and program completers, featuring information on the placement file system and certification (both in-state and out-of-state). District personnel from eight local school districts (first-year teachers, principals, personnel directors and superintendents) gave information on what is expected from a first-year teacher, interviewing techniques and district hiring practices.

The annual survey of student teachers and their classroom supervising teachers reflected a strong, positive attitude of University graduates toward the education, preparation and training they received in the College of Education. With a 70 percent response, results in both the fall and spring surveys were rated predominantly outstanding to excellent on the effectiveness of the teacher education program.

The Office of Educational Services and Placement also revamped its placement file system. In the past, identical forms were used by all individuals participating in the placement file system. This year, and in years to come, individuals will tailor-make their placement file to suit their individual needs.

The office also processed more than 1,500 applications for certification, fingerprint cards, checks and transcripts for initial and add-on certification, both in-state and out-of-state. It should be noted that, of the 328 teaching preparation program graduates, only 11 undergraduate students did not meet all preprofessional standardized testing requirements for S.C. teacher certification. This performance allowed the college to report that 96.6 percent of all teacher preparation program completers were eligible for teacher certification in their area of specialization.

Office of Extension and Public Relations

In its role as an enrichment and outreach component of the College of Education, the Office of Extension and Public Relations achieved measurable success during the 1992-93 academic year, with record numbers of enrollment and public relations publications. A total of 316 courses were offered during the fall, spring and summer sessions at numerous sites throughout the state as well as in bordering states, with a record enrollment of 3,816 graduate students and 421 undergraduates. This gave a total of 4,237 registered students for a growing number and variety of classes. These courses provided both undergraduate and graduate instruction not only in professional education but also in such other academic areas as mathematical science, industrial education, agriculture, nursing, economics, vocational-technical education, English, forestry and management.

The off-campus program provided 110 courses during the fall 1992 semester, 102 during spring 1993, and 104 during the two summer sessions of 1993. These courses included those that constituted a regular part of the degree program curricula at the University, as well as others designed especially to meet specific needs of individual school districts and other agencies. Regional centers for providing off-campus courses on a regular cycle were maintained in Greenville at the University Center on the Greenville TEC campus as well as at Piedmont TEC in Greenwood.

Public relations efforts on behalf of the College of Education constitute another important responsibility of this office. With the increasing number of research achievements, grantsmanship successes, collaborative efforts with school districts, and service activities by the faculty, the necessity for a uniform, planned program of public relations grows in importance. A consistent program of public news releases has been undertaken on a regular basis to inform the public about specific program accomplishments and personnel achievements. In addition, the office is the editorial and publishing center for the only two teacher education publications in the state, the *SCACTE Journal* and *South Carolina Classrooms*. Both are circulated each semester to all teacher educators at all levels in South Carolina under the auspices of Clemson's College of Education. The office also publishes the *Clemson Educator*, a newsletter for alumni, friends and other supporters of the College of Education and maintains regular liaison activities with the University's public relations offices.

Office of Field Experiences

The Office of Field Experiences during 1992-93 placed a record 2,075 students, a 5 percent increase in placements when compared with the previous year. A variety of pre-student teaching observation/participation experiences were arranged for 1,484 students; student teaching placements were made for 378 students; and practica placements numbered 213, with 17 at the undergraduate level and 196 at the graduate level.

Ninety-three classroom teachers and 11 Clemson faculty members received APT (Assessments of Performance in Teaching) training through participation in one of the three-day sessions scheduled during the fall and spring semesters. Twelve other teachers gained re-endorsement as an APT observer by participating in a one-day training session. The survey of student teachers and supervising teachers reflected a high-level of satisfaction with the supervisory processes used by the col-

lege supervisors in their observations and evaluations of student teachers. More than 70 percent of the students and the classroom teachers responded to the survey for the fall and spring semesters.

COLLEGE OF ENGINEERING

With a new dean of engineering on board, the College of Engineering has indeed had an exciting and successful year.

The year was highlighted by the ground breaking ceremony for the Fluor Daniel Engineering Innovation Building, the first state-funded engineering building at Clemson University in more than 23 years. Held to honor the more than 325 donors who gave more than \$4 million to the facility, the ceremony echoed the importance of the \$18 million building to the more than 200 faculty, staff, students and special visitors attending. The facility will house offices and labs of the Department of Mechanical Engineering and the Department of Electrical and Computer Engineering.

Upon completion in spring 1995, the building will contribute to the task of broadening engineering education and economic development in South Carolina. The research conducted not only will benefit Clemson engineering students, but also will provide S.C industries with competitive and productive technological information. The College of Engineering is committed to the future challenges and opportunities that the facility will offer and looks forward to building the bridge between academe and industry.

Owing to the generous donations of \$500,000 each by George Bishop III and P.W. McAlister, ground was broken on the Bishop Center, a research facility that will house Clemson's Center for Engineering Ceramic Manufacturing. Along with private donations, more than 20 brick and ceramic companies donated more than \$2.3 million to equipping the facility, which will be located at the Ravenel Research Park. Completion is expected sometime in 1994.

Clemson's College of Engineering embarked on a journey with eight other Southeastern U.S. engineering schools to revolutionize engineering education through SUCCEED — the Southeastern University and College Coalition for Engineering Education. SUCCEED is one of four university consortia funded by the National Science Foundation under the NSF Engineering Education Coalitions Program.

SUCCEED's goals are to substantially improve the quality and relevance of engineering degree programs and to positively impact engineering education in the 21st century. To reach these goals, SUCCEED schools are developing new undergraduate engineering curriculum models with respect to the changing needs and requirements of the engineering profession. The participating schools conduct programs of educational and curricular research, development and implementation. Some of the SUCCEED programs at Clemson include:

- Integration of Fundamental Principles and Key Concepts Throughout An Innovative Engineering Curriculum: ME professors Donald E. Beasley, C.O. Huey and Eugene Bishop examine in detail existing engineering principles to propose a plan for continual curriculum renewal. By tracing the development of fundamental principles and key concepts through years and over courses, a detailed course syllabus will be developed for each engineering course to incorporate learning scales and identify fundamental areas of emphasis.
- A Collaborative Learning Experience for Freshman Engineering Students: ECE professor Robert W. Snelsire and Susan Lasser, director of the College of Engineering Minority Program, direct a collaborative learning work-

shop offered to engineering freshmen and keyed to the University's second semester calculus course.

- Internationalization of the Engineering Curriculum: Stephen S. Melsheimer, CHE professor; John C. Bednar, associate professor of languages; and Chris Przirembel, ME department head and professor, have developed the Engineering Program for International Careers. This program offers engineering students foreign language skills and international experience to complement the technical content of an engineering degree, thus preparing graduates to compete in the global marketplace. The highlight of the program is a semester spent working overseas for an international company, along with an opportunity to spend the following semester studying abroad.

Perhaps the key event of the year was the national search for a new engineering dean. On June 22, 1992, Dr. Tom Keinath, formerly head of Clemson's Environmental Engineering Department, was named the new dean of the College of Engineering and began his duties on July 1, 1992.

One of the first initiatives the new dean began was a comprehensive review of all college operations. To help the dean define barriers to quality and identify opportunities for improvement, the Engineering Administrative Support Quality Council, the Engineering Technical Staff Quality Council, the dean's Undergraduate Quality Council and the dean's Graduate Quality Council were formed in September 1992.

A Strategic Planning Committee also was formed, charged with developing vision and mission statements for the college, developing goals and benchmarks, and developing a strategic implementation plan for the College of Engineering. As of the end of the fiscal year, a mission statement and guiding principles had been drafted, with work continuing on a vision statement for the college.

The mission statement reads that "the College of Engineering provides undergraduate and graduate educational programs grounded in fundamentals which prepare graduates to apply engineering principles creatively and responsibly. We also generate, disseminate and apply engineering knowledge for the benefit of South Carolinians and the global community."

To this end, the college will be guided by the following principles: our primary role is education; we believe our scholarly endeavors — teaching, research, synthesis and application — are mutually supportive; we encourage and support academic, professional and personal development; our students must develop the ability for self-education; we pursue excellence in all endeavors; we believe in intellectual freedom; our conduct must be characterized by ethics, integrity and honesty; and we value the esprit de corps, pride and loyalty that underlie the Clemson tradition.

Other major events from the nine academic departments during the past fiscal year included:

- Dr. Joe Brunn, professor in the Department of Agricultural and Biological Engineering, was named a fellow by the American Society of Agricultural Engineers in July 1992 for his "high standards of excellence in education."
- Dr. Andreas F. von Recum, head of the Department of Bioengineering, was selected for the Hunter Endowed Chair in Biomaterials. The Hunter Professorship was the first such position established worldwide for research in biomaterials engineering and science and the first endowed position at Clemson University.
- Dr. Gene Haertling, the Bishop Distinguished Professor of Ceramic Engineering, received the Public Service Medal from the National Aeronautics and Space Administration for his work in making piezoelectric materials more versatile and powerful.
- Nancy Hyatt, a senior in chemical engineering, received second prize for her presentation entitled "Selection of Aeration Technologies for Post-Oxygenation of Wastewater Effluent," and Jenny Long, also a senior in chemical engineering, received third prize for her presentation entitled "Re-

removal of VOCs from Aqueous Streams Using Micelle-Enhanced Ultrafiltration" at the Southern Regional Conference of the American Institute of Chemical Engineers.

- Dr. Serji Amirkhanian, assistant professor in the Department of Civil Engineering, received the college's McQueen-Quattlebaum Award. He is working to use scrap tires in asphalt pavement in a joint project with the S.C. Department of Highways and Public Transportation, the Federal Highway Administration and Michelin Corp.
- In February 1993, Dr. A. Wayne Bennett was named senior vice provost and dean of Graduate School at Clemson. Bennett had been acting senior vice provost since September. He joined Clemson as department head of electrical and computer engineering in 1981, and in 1989 was named the college's associate dean for research and external affairs.
- Dr. Rajendra Singh, the D. Houser Banks Professor in Electrical and Computer Engineering, was elected fellow by the American Association for the Advancement of Science based on his contributions to microelectronic processing, particularly rapid isothermal processing, and to the physics and technology of solar cells.
- Dr. Craig Adams, assistant professor in the Department of Environmental Systems Engineering, was the only S.C. professor to receive a National Science Foundation Young Investigator Award. Dr. Adams also received the First Place Academic Achievement Award for best dissertation from the American Water Works Association.
- The Clemson Alternative Automotive Technologies team placed second overall in the First Clean Air Vehicles Association Grand Prix in Atlanta. The team, made up of eight mechanical engineering students, equipped a VW Rabbit to run on 20, 16-volt batteries.
- During the 1992-93 year the College of Engineering again was the largest college on campus, with 3,330 undergraduates and 798 graduate students enrolled. The college granted 452 B.S. degrees, 189 M.S. degrees and 19 Ph.D. degrees.
- The College of Engineering had active research contracts for FY '92-93 totaling \$22,935,674, with new research awards of \$9,680,057 and \$8,743,235 in research expenditures. Some 98 faculty members were involved in research projects, with 192 new projects being funded in the past fiscal year.

Other college-wide programs can be proud of their own success stories:

- Robert J. (Bob) Mussro has joined the Office of Continuing Engineering Education as environmental projects coordinator and lecturer in the College of Engineering. His position is funded by S.C. Universities Education and Research Foundation's Hazardous Waste Management Research Fund. Along with teaching seminars, he develops, coordinates, implements and evaluates a full range of environmental, health and safety seminars with an emphasis on pollution prevention.

CEE seminars and classes hosted 1,768 attendees this year, and more than 150 attended the year's CEE Environmental Law Seminars with U.S. Rep. Bob Inglis.

With a goal of \$7.5 million, the College of Engineering, lead by Director of Development Perry Fulkerson, raised more than \$5.8 million, which included gifts of more than \$4.1 million and pledges of more than \$1.7 million.

In addition to the Bishop Center campaign, one of the major activities culminated in October 1992. Employees of Exxon Corp. raised more than \$500,000 to endow the Exxon Employees' Distinguished Professorship in Engineering. The gift will provide a substantial supplement to attract and keep a prominent scholar in either chemical, civil, electrical, environmental or mechanical engineering.

Many faculty, staff and students of the college received awards this past year. They include:

- Three Clemson engineering students received National Science Foundation graduate fellowships: Irene Jane Beyerlein, Stanley Thomas Birchfield and John David Shumpert. Shumpert will be using his award to pursue a graduate engineering degree at Clemson.
- Linda Jenkins, a histology technician in BioE, ASCP, received the 1992-93 National Society for Histotechnology scholarship award.
- Dr. Eric H. Snider, CEE director and a lecturer in ESE, received the "Educator of the Year" Award from the Piedmont Chapter of the S.C. Society of Professional Engineers.
- Dr. Elham B. Makram, ECE professor, received the 1993 Distinguished Engineering Educator Award from the Society of Women Engineers.
- Dr. Lew Fitch, an Alumni Distinguished Professor in ECE, received the 1993 Community Service Faculty Award from the University.
- Dr. Adly Girgis, ECE professor, received the 1993 Alumni Award from Clemson.
- Mark Allen Wait, a graduate student studying ECE, received the 1992-93 Tennessee Valley Chapter-American Vacuum Society scholarship based on his academic record; research accomplishments in applied or fundamental surface science, vacuum technology, vacuum metallurgy, fusion energy, thin films, or electronic materials and processing; and professional potential.
- Dr. C.P. Leslie Grady, the R.A. Bowen Professor of ESE, was elected to fellowship by the board of governors of the American Academy of Microbiology.
- Dr. Cecil O. Huey, ME professor, was named the University's faculty representative to the National Collegiate Athletic Association.
- Mrs. Wanda Reed, administrative assistant in ME, received the national special service award from the American Society for Deaf Children for her "extraordinary dedication and service to ASDC, deaf children and their families."

COLLEGE OF FOREST AND RECREATION RESOURCES

The report of 1992-93 activities for the College of Forest and Recreation Resources' academic, research and Extension programs is included under the Division of Agriculture and Natural Resources on page 115.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts continues to subscribe to the notion that no university ever will achieve greatness without a strong program in the humanities, performing arts and social sciences. In addition, the college continues to subscribe to the notion that a self-governing society requires of its citizens a basic and general education that will enable them, regardless of the career paths they follow, to lead full and thus useful lives, and to contribute to the general welfare of society.

While the undergraduate student population at Clemson rose 32 percent in the last decade, undergraduates majoring in the liberal arts rose 118 percent. The faculty of the college teach approximately one-fourth of the credit hours taken by stu-

dents; and, of the 38 semester hours needed to complete the University's "general education requirement," the college contributes nearly all of the courses for 21 of these hours.

The College of Liberal Arts comprises the departments of English, History, Languages, Performing Arts, Philosophy and Religion, Political Science, Psychology and Sociology. All departments offer majors leading to the B.A. degree. English and History offer the M.A. degree; English also offers the M.A. in Professional Communication; Psychology offers the M.S. in Applied Psychology. The Commission on Higher Education approved for implementation in the fall of 1994, a Ph.D. degree in Industrial/Organizational Psychology, which will be the first doctoral program offered in the history of the college; Sociology offers the M.S. in Applied Sociology; and Political Science offers the M.P.A. in Greenville in conjunction with the University of South Carolina at Columbia.

More than 90 percent of the tenured and tenure-track Liberal Arts faculty hold the doctoral or other terminal degree. Graduates of the college enter some of the country's outstanding graduate and professional schools; many of the graduates pursue careers in business (including the service industries), industry and government upon earning their degrees.

Faculty Highlights

Several highly respected journals emanate from the College of Liberal Arts. *The South Carolina Review* is edited by faculty members in the Department of English. This distinguished magazine, whose contributors have earned a number of awards, provides a forum for literary scholarship and criticism, as well as for outstanding poetry and short stories. *The Upstart Crow: A Shakespeare Journal*, which also is edited in the Department of English, features scholarly articles from eminent Shakespeareans on all aspects of Shakespeare: his life, the editing of his plays and poetry, dramatic and film productions of his plays, and the interpretation and teaching of his work. Both *The South Carolina Review* and *The Upstart Crow* are desktop designed and published in the college's own desktop publishing laboratory in Daniel Hall. The lab is staffed by graduate assistants enrolled in the English Department's M.A. in Professional Communication program. With an international editorial board under the leadership of a faculty member in the Department of Political Science, *The Journal of Political Science* boasts a list of authors from leading colleges and universities from this country and from overseas. This journal emphasizes the scholarly contributions of younger researchers and addresses themes that appeal to a broad range of scholars, not merely those in political science. This year's issue, for example, was devoted to "Mass Media and Politics."

Liberal Arts faculty also continue to be extremely active in scholarly and creative endeavors. They deliver papers at numerous regional, national and international meetings and conferences; they contribute articles, poetry and fiction to a variety of established and influential journals; they edit book-length collections and prepare textbooks; they are active in musical and dramatic performances; and they write books in their areas of expertise that are issued by respected publishers and that receive favorable notices in the press. In 1992-93, faculty members in the Department of English produced eight books and a prize-winning documentary film entitled "Red to the Rind" on the jazz festival in New Orleans. Members of the History faculty published five books, while a total of two book manuscripts were accepted for publication by members of that department. The faculty of Philosophy and Religion had six books either published or accepted for publication in 1992-93. For the second time in three years, a Political Science faculty member won the Alumni Master Teacher Award, while department faculty authored or edited more than half a dozen books.

A member of the Department of English was awarded an Alumni Distinguished Professorship.

In addition, and as further acknowledgment of the recognition faculty members in the College of Liberal Arts are receiving, they often hold positions as officers and as board members of a number of professional organizations and societies. For example, a Political Science faculty member continued to chair the J. William Fulbright Foreign Scholarship Board. A sociologist served as president of the National Association of Marital and Family Therapy. A Performing Arts faculty member was re-elected as administrative vice president for the Southeastern Theatre Conference (SETC), a 10-state, 3,400 member professional organization, while another faculty member in that department was appointed chairman of the Playwriting Committee of the SETC New Play Project. A member of the English Department served as president of the American Popular Culture Association. Too, the faculty serve on editorial boards in their areas, as manuscript referees for publishers and as evaluators of grant proposals.

Other departmental activities include, but are not limited to, the following: a book review service originating in the Department of English that specializes in children's books; research conducted by the Department of Psychology in a variety of topics such as aging, industrial safety, stress management, computer-assisted instruction, artificial intelligence, consumer behavior, decision-making strategies, the development of pattern vision in children, eating disorders and substance abuse; and research conducted by faculty in the Department of Sociology in several areas including police violence, parental grief, child abuse, children's responses to crises, alcohol consumption, abortion, homelessness and the sociology of emotions. Under the direction of a Performing Arts faculty member, a play presented by the Clemson Players, the student theatre group, advanced to the Region IV Kennedy Center/American College Theatre Festival competition held at Auburn University, marking the fourth such appearance by the Clemson Players. Under the direction of another faculty member in Performing Arts, the Clemson University Chamber Singers performed a prelude concert in Carnegie Hall. In addition, the Chamber Singers participated in a joint concert under the baton of the world-renowned conductor John Rutter, also at Carnegie Hall. The University of Southern Illinois Performance Studies Department produced a stage adaptation of a book authored by a faculty member in the Department of Performing Arts. In addition, a play authored by another Performing Arts faculty member received a staged reading at the Emmet Robinson Theatre at the University of Charleston.

Regular features of the College of Liberal Arts include gatherings of scholars and creative writers. The Department of English continued to host the Southern Circuit Film Series, which brought independent filmmakers to the campus to show and discuss their works. The Departments of Performing Arts and English co-sponsored the second annual Clemson Shakespeare Festival in early March. The week of activities featured productions of Shakespeare's plays by the Shenandoah Express and the Actors from the London Stage, among other theatre groups. As with the first Clemson Shakespeare Festival, approximately 10,000 attended the productions, the film festival of selected plays, and the public lecture series given by internationally prominent Shakespeareans. Galway Kinnell, winner of the National Book Award and the Pulitzer Prize for poetry, gave two readings on campus, and a colloquium was held by the English Department to honor the 50th anniversary of the publication of *Red Hills and Cotton* by Clemson's own Ben Robertson.

Public Service

The public service roles played by the College of Liberal Arts throughout the state and region continue to experience significant growth. Political Science faculty are frequently called upon by units of state and local government for advice in such areas as poll-taking, taxation and government organization. In addition, political scientists often serve as panelists for civic organizations and as consultants to both the print and electronic media on national and international affairs.

Sociologists contribute their expertise in such areas as the design and analysis of social surveys, leadership, the impact of industrial development on society, as well as in program development and evaluation in the fields of prison reform, spouse abuse, child custody, mental health, and alcohol and drug problems. Faculty in Sociology also offer workshops in staff growth and development for both private and public service agencies. Graduate students in Applied Sociology provide analyses of operating structures of public service agencies, community needs assessments, and research in drop-out prevention. Psychologists continue to serve as consultants to the Southeastern Managers Network, an information-sharing organization of senior managers representing more than 20 area businesses and industrial concerns. Psychologists also continue to provide consultation on jury selection, eyewitness validation and expert witnesses on criminal sanity. Graduate students in the Applied Psychology program provide a wide spectrum of services, including training, personnel selection, job analysis, and labor-management relations to area industry and businesses. English faculty members conduct seminars and workshops in business and technical writing. One English faculty member was selected by the S.C. Arts Commission to be on the S.C. Readers Circuit for 1992-93. Members of the theatre faculty in Performing Arts maintained active professional careers by acting and designing at such professional theatres as Mill Mountain Theatre in Roanoke, the Warehouse Theatre in Greenville, and the Utah Shakespeare Festival in Cedar City, Utah. A faculty member in Performing Arts continued to serve on the board of trustees of a private college.

In conjunction with its traditional language programs, the Department of Languages has sponsored since 1971 an annual Language Declamation Contest for high school students of modern and classical languages. This year's contest drew nearly 600 participants from South Carolina and nearby states. In the summer of 1993, the department sponsored study abroad programs to France and Spain. The Department of Languages also recognizes that it has a special mission in a world becoming more internationalized with each passing year. Given the large foreign investment in S.C. industry and the need to develop overseas trade markets, the department's Language and International Trade major continues to represent an apt response. An important component of this major is its required internship program. This summer, 16 Language and International Trade majors represented Clemson in five foreign countries: Costa Rica, Mexico, Argentina, France and Germany. Graduates of the Language and International Trade program now are working throughout the Eastern United States, Europe and Asia, and are employed by such companies as Synair (Tennessee), Disney World (Florida), Tiffany's (New York), Leslie Evans Creatives and Delta Airlines (Georgia), S.C. National Bank (South Carolina), EuroDisney (France), Walt Disney Attractions (Great Britain), and Pitney Bowes (Germany).

Among the continued recipients of the college's public service activities are the state's school teachers. Improved civic education in the state's public schools is the goal of the Thurmond Seminar, an annual cooperative venture of the Department of Political Science and the Thurmond Institute of Government and Public Affairs. Twenty social science teachers from the state's secondary schools participated in the 1993 summer seminar, with classes held both in Clemson and in Washington, D.C. The U.S. Institute of Peace provided funding support for the 1993 session, which focused on "The Collapse of the Soviet Empire and the New World Order." Liberal Arts faculty also held summer institutes on campus for advanced placement teachers in U.S. History, French and Spanish.

The Bread Loaf Rural Writing Network, Middlebury College's Bread Loaf School of English, and Clemson's Department of English continued their partnership in administering grants to teachers and students in several public schools in the state. Piloted by the Bread Loaf Rural Writing Network in South Carolina, Project REACH (Rural Education Alliance for Collaborative Humanities), which is funded by a Rockefeller Foundation grant channeled through the S.C. Humanities Council, still operates out of a base in the Department of English.

The Bingham Trust continued to fund two programs, Writing in the Schools and Performing Across Cultures, which are collaborative ventures between the University and the secondary schools to improve writing and to foster cultural awareness. Additional outreach activities include faculty from the Department of Performing Arts serving regularly as judges for competitions in such areas as music and theatre in the region and state. In addition, "Theatre for Young Audiences," a touring theatre company made up of University students and faculty, along with townspeople, under the direction of a theatre faculty member, presented more than 30 performances in the public schools of Pickens, Oconee, Anderson and Greenville counties. Also, the Music Preparatory Program of the Department of Performing Arts expanded this past year to include music therapy as an offering in addition to Kindermusik and Suzuki instruction.

The College of Liberal Arts serves the entire Clemson student body in a variety of ways other than through direct classroom instruction. For example, Clemson's delegation to the Model United Nations, sponsored by the Department of Political Science, has won numerous awards at regional and national meetings over the last decade. In 1993 the delegation won honorable mention at the national conference in New York. Political Science also advises Clemson's delegation to the S.C. Student Legislature and the government internship program, the former involving an annual competition in Columbia and the latter involving students participating in local, state and national government. The Department of Performing Arts sponsors "New Plays Premiere," which showcases each summer new work by student and faculty playwrights. The Department of English operates the Writing Laboratory, which is available at no charge to all students on campus with writing deficiencies.

The college also contributes to University life by supporting a number of student organizations and extracurricular activities. For example, Performing Arts oversees the Clemson Players, the student drama group that stages four plays during the academic year and two during summer school. Some of its productions have received regional and national recognition. Many musical activities also are under the direction of Performing Arts: the University Concert Series, Robert and Lillian Utsey Chamber Music Series, and student organizations including Tiger Band, Symphonic Band, C.U. Chamber Orchestra, University Chorus, Chamber Singers, C.U. After Six Singers, and Jazz Ensemble. The Department of English provides faculty advisers for two student publications: *The Chronicle* and *The Tiger*, the weekly student newspaper that has earned a number of collegiate awards.

Program Development

The R. Roy and Margery W. Pearce Center for Professional Communication continued to co-sponsor many activities in the Department of English, including the Bard College Writing Program, which was made possible by a grant from the Bingham Trust, as well as the Career Workshop program for minority students.

The College of Liberal Arts Advisement Center, which began operations in the summer of 1988, has as its principal activity the academic advisement of approximately 250 undergraduates enrolled as Liberal Arts (undeclared) majors, a category designed for students who have not yet decided on a major area of study and are in the process of exploring academic options.

In conjunction with its freshman English program, the Department of English brings to campus each year a notable writer. In the fall semester, Ernest Gaines, a National Book Award winning African American novelist, spoke on his novel *A Gathering of Old Men*, which was read by all freshmen in composition classes.

Approved this year for implementation next year is a five-year interdisciplinary program for undergraduates majoring in Engineering. The Department of Languages will cooperate with the College of Engineering in the program called EPIC (The Engineering Program for International Careers). Engineering students will focus on a language and will complete a domestic internship for an international engineering company, along with a four-month internship abroad at the same compa-

ny. By the summer of 1994, the Languages Department will have a language institute in place to support the program.

The Language and International Trade undergraduate major continues to represent one of the significant bridges erected by the College of Liberal Arts to span the gap between the liberal arts and the scientific and technological disciplines on campus. This major joins Liberal Arts with the colleges of Agricultural Sciences, Commerce and Industry, and Forest and Recreation Resources in a most successful interdisciplinary effort. Another continuing and successful interdisciplinary endeavor, Communication Across the Curriculum, which is housed in the departments of English and Performing Arts, involves all nine academic colleges in the communal goal of improving the writing skills of students. Recognizing the emergence of a new world political order, a Political Science faculty member continued to teach international relations courses in Spanish and will start a French track in the fall.

The Commission on Higher Education approved Speech and Communication Studies as a new undergraduate major. This B.A. degree program promises to be attractive to our students.

The Department of Psychology's M.S. degree in Applied Psychology with tracks both in human factors and industrial/organizational psychology has completed a very successful fifth year. Its graduates are in demand by both regional and national companies. The M.P.A. program, offered at the University Center in Greenville and jointly offered with the University of South Carolina at Columbia, grew to nearly 40 students, many of them already employed in local government in the Greenville-Spartanburg metropolitan area. Graduates from the M.S. in Applied Sociology, which completed its second year, find career placement both in private and public organizations and agencies.

The remodeling of Brackett Hall was completed during the year in question, providing homes for the departments of Political Science and Sociology, in addition to Psychology, which was relocated into Brackett Hall the year before. Its sky-lit atrium already has become a regular gathering place for both faculty and students. The Robert Howell Brooks Center for the Performing Arts remained under construction, with a target date for occupancy sometime in the fall 1993 semester.

COLLEGE OF NURSING

The College of Nursing has demonstrated continued growth in its academic, professional service and research programs during the 1992-93 academic year. Enrollment in the undergraduate programs has increased significantly. The college continues to provide service to the community through a variety of professional activities. Significant support for college programs is being derived from overall college development activities.

Administration

Dr. Opal Hipps, dean, provided leadership for the achievement of the college mission. The Department of Nursing Science offers all academic course work leading to a baccalaureate degree or a master's degree with a major in nursing. The Department of Health Sciences offers all academic course work leading to a B.S. degree in Health Science.

The college continues to serve the community and citizens of South Carolina through the Department of Continuing Education and the Department of Professional Services.

The Office of Development in the College of Nursing is responsible for attracting support of constituent groups through innovative and creative programming and

writing to encourage gifts focused on college priorities. This mission is advanced through three basic components: fund-raising, alumni affairs and public relations.

The goal for gifts and pledges of 1992-93 was \$220,000. Gifts received this year total \$193,187. New pledges were documented at \$71,150. The total amount of gifts and pledges for 1992-93 amounted to \$264,337.

The Helene Fuld Health Trust has pledged to grant the college \$50,000 to update the Media Resource Center. Anderson Area Medical Center, St. Francis Hospital and Baptist Medical Center-Easley continue to support the college with endowment and annual gifts. Bill and Susan Orr endowed a new scholarship program at \$25,000, and the Howle family has created a new faculty enhancement program.

More than 90 personal visits were made during the year, and 65 prospective donors were identified and are at various stages in the cultivation process. Sixty-five proposals were delivered.

One of the basic components of alumni relations for the college is publishing the newsletter *Recent Developments*. Two issues were produced during 1992-93. Additionally, delivery of a special edition Silver Jubilee Nursing Directory went out to all alumni in August. In other alumni affairs, Dr. Becky Campbell was selected as Alumni of Merit at the second annual recognition program in May.

The premier public relations activity of 1992-93 was the year-long celebration of the college's 25th anniversary Silver Jubilee. Some of the events planned especially for the Silver Jubilee included the Sullivan Wellness Center dedication (September), College of Nursing honor roll (November), Edwards Hall dedication (December), College Silver Jubilee birthday party (March) and the Silver Jubilee convocation (May).

Also in connection with the Silver Jubilee recognition this year, a public relations packet of health, nursing and related articles and opinions was produced by faculty and students and distributed to the media. Many of these articles sparked additional interviews and enabled the college to showcase some of the outstanding work of students and faculty members.

Teaching

Nursing Science

During the 1992-93 academic year there were 710 students enrolled in the Department of Nursing Science: 622 undergraduate and 88 graduate. This enrollment represents an increase of 197 students (28 percent) when compared with 1991-92.

Of the 88 graduate students, 85 were degree-seeking, three were non-degree seeking, five (6.4 percent) were minority, and none were males. Of the 622 undergraduate students, 73 (12 percent) were minority, and 49 (8 percent) were males. Ninety-nine students completed requirements for the B.S. degree, and 15 completed requirements for the M.S. degree. The NCLEX-RN pass rate was above the state and national mean for both July 1992 and the February 1993 writing.

A Helene Fuld grant enabled the department to initiate automation of at least one nursing course. Other accomplishments in the teaching program included: initiation of the graduate curriculum revision including development of a graduate-level pharmacotherapeutics course; agreement with Greenville Technical College; development of an enrollment and faculty staffing plan based upon departmental resources; improving enrollment in the RN/BS/MS program; expanding summer course offerings; and expanding the computerized data base with access provided to all faculty.

The international learning experience again was offered. Dr. Arlene Privette, along with five students, spent a month in the Netherlands studying health care. The exchange continued with a faculty member and two students from the Netherlands spending a month in South Carolina studying health care in the United States.

The college sponsored its 11th annual week-long summer nursing career camp for rising high school juniors and seniors. Baptist Medical Center-Easley co-sponsored the camp, which enrolled 36 students, 17 of whom were minority.

Health Science

The Department of Health Science faculty have completed the implementation of the junior year of the Health Science curriculum. Three new courses were taught for the first time. In addition, guidelines for the senior year field experiences, and a senior paper were developed.

The Senior Departmental Honors Program was where Health Science was developed and approved. The design allows honors students to work with faculty mentors in small seminar groups and includes one seminar each semester during the junior and senior years, including a research component.

The number of majors in Health Science continues to grow. At the end of the academic year, our records indicated 135 majors, the majority of whom are change of majors. The number of students enrolled in health courses in 1992-93 was 1,541, an increase of 50 percent from the previous year.

The faculty and Office of Enrollment and Advisement have worked together to develop Guidelines for Student Advisement, a recruitment/marketing plan, brochures about the major and other related activities.

Research

The Department of Research provided technical support and scientific assistance to faculty and students who conducted research under the auspices of the college. A new system of disseminating research-related information via the college communication network was implemented as a cost-saving measure. Calls for abstracts and grant alerts were communicated to faculty by computer mail.

The seed grant program for the college was administered through the academic departments with assistance from the Department of Research. Three faculty received summer salary support to prepare NIH research grant proposals. Two AREA grants were submitted by health science faculty (Kemper and Rainey), and one RO1 application was submitted by an interdisciplinary team led by a nursing science faculty member (Oldaker).

Extramural research funds were received by two health science faculty, Drs. Kemper and Rainey, (from the Center for Disease Control) and by two nursing faculty, Drs. Kline and Pruitt, (from the American Nurses' Foundation). The nursing faculty will conduct an immunization service delivery project with evaluated outcomes. A master's degree student in nursing will conduct her thesis as part of the project. Other extramural funds include the last year of funding for the current AREA grant on ostomy care held by Dr. Debra Jackson, head, Department of Health Science.

Intramural funds were obtained by three nursing faculty, including two faculty conducting dissertation research in the Netherlands and United States (Smart and Milstead), and one nurse (Privette) who is the first college faculty member to receive funds as principal investigator on a collaborative study with the staff at the Greenville Hospital System under the cooperative agreement with Clemson University.

Extramural submissions increased to 14 for the most productive year ever, with an RO1 submission on AIDS (Murrow) and two on at-risk minority youth (health science and nursing interdisciplinary teams led by Jackson and Oldaker). Other extramural research applications were submitted to Andrus Foundation (Timms), Sigma Theta Tau (Smart), American Nurses' Foundation (Curtis) and NAACOG (Bradberry), in addition to three AREA grant applications (Hughes, Kemper, Rainey) and the CDC funds received by health science faculty.

Service

The College of Nursing provides service to the community through a wide variety of professional activities. Formal links to public and private service agencies

and organizations exist throughout the state. The college maintains active representation through contractual and/or liaison agreements with the following:

- Area Health Education Consortium Nursing Council
- S.C. Public/Academic Mental Health Consortium
- S.C. Gerontology Center Policy Board

Individual faculty serve as active representatives to many community service agencies which include:

- S.C. Commission on Aging statewide advisory committee on Alzheimer's disease
- Board of directors, Upstate chapter of the Alzheimer's Association
- Committee on Nursing Education, S.C. Nurses' Association
- Hospice of Anderson

The Department of Professional Services has consisted of two programs that provide specific nursing, health and educational services to the public. The Nursing Center is a nurse-managed clinic that offers the public direct access to professional nursing services. These services include health assessment, screening and monitoring for chronic diseases, health information and support, counseling, and skilled nursing care. The Wellness Center is a voluntary, comprehensive health promotion effort designed to result in healthier lifestyles and personal well-being for University students and employees and to help to contain health-related costs. The program assists participants in the active process of becoming aware of and making informed choices about factors affecting their health and well-being. In addition to serving the University campus, the program serves S.C. businesses and industry by providing health screening and health promotion programs to companies requesting them.

Revenues for the Nursing Center increased by 12 percent, and revenues for the Wellness Center increased by 5 percent from those received during 1991-92.

Increasing the public's access to health services continued to be a focus for the Nursing Center. Individual clients made a total of 3,077 visits for Nursing Center services. In addition, on-site services were provided to the community through use of the mobile unit, including a flu/shot clinic in Pendleton and a migrant health project in Long Creek. In September and October 1992, through an arrangement with the Office of Migrant Health, the mobile clinic was driven to Long Creek to implement an evening clinic for migrant workers. Utilizing the assistance of senior nursing students, health care services were provided to 53 migrant workers for a total of 114 visits. Plans are to expand this initiative in 1993.

In addition to the mobile clinic, the Nursing Center provided a wide array of services for economically and culturally diverse populations. These include asbestos removal workers' physical exams, family planning services, the WIC program, EPSDT screenings, flu shots, immunizations, child developmental assessments and physical exams, and CPR classes.

The Wellness Center continues to expand services on and off campus. For the third year, letters were sent to all deans on campus early in the fall semester which offered screening services to be brought to their buildings. Subsequent screenings were held on nine University sites.

Pamphlets on the Wellness Center and Worksite Health promotion were given to various groups that visited the College of Nursing during the year. These same pamphlets were sent to various corporations and businesses, and contacts were made to establish a range of health promotion activities.

On April 1, 1993, the third annual Youth Fitness Day was held for all fourth graders in Pickens County. This event was hosted by the Pickens Approach to Health coalition, the College of Nursing and the College of Education. More than 1,200 fourth graders from Pickens County elementary schools were on campus for

a day of fitness fun and assessment. Health Science faculty and students were responsible for the body mass assessment and nutrition education. Staff from the wellness program also participated.

The seventh annual Wellness Challenge encouraged regular aerobic activity in 175 students and employees in the spring semester. Many of the participants have continued during the past five to six years. Results continue to show that those who participate over time are reducing their health risk indicators.

In addition to the University slimdown programs, a number of companies took part in programs.

A major accomplishment was the development of a student health/wellness group called Excel. The group has increased to 45 students.

The departmental faculty in Health have been involved in many service activities this year. The major commitment has been with S.C. Healthy People 2000 program for Greenville and Pickens County. Dr. Rainey and Dr. Jackson serve on a steering committee for the coalition, and Dr. Rainey is vice chair of the Pickens County subgroup. In addition, Dr. Jackson wrote a biweekly newspaper column on health issues and cohosted a weekly health talk show on WCCP radio in Clemson. Dr. Jackson completed the Clemson Leadership Program through the Clemson Chamber of Commerce. The work which has been done with community leaders has led to more than 30 health promotion sites for field experiences for Health Science students.

Outstanding Faculty Accomplishments

- Dr. Debra Jackson, Department of Health Science, coauthored the text "Child Health Nursing: A Comprehensive Approach to the Care of Children and Their Families" and "Gastrointestinal Disorders."
- Dr. Karen Kemper, Department of Health Science, presented an abstract entitled "Black and White Females' Perceptions of Ideal Body Size and Social Norms" at the American Public Health national meeting.
- Dr. Debra Jackson was awarded a community service award by Clemson University.
- Drs. Karen Kemper and Cheryl Rainey, Department of Health Science, received a \$5,000 grant from the Center for Disease Control. The study is entitled, "Nutritional Knowledge, Beliefs and Attitudes of School-Aged Children's Parents."
- Dr. Arlene Privette, Department of Nursing Science, received a \$5,000 grant from the Clemson University and Greenville Hospital Research and Education Cooperative Program. The grant is entitled, "An Exploratory Study of the Rehabilitation of Cancer Patients Who are Receiving Peripheral Stem Cell Treatment."
- Dr. Pam Kline, associate dean, has been named to the S.C. General Assembly's blue ribbon task force to study the planning, coordination and delivery of services to Alzheimer's victims and their families.
- Drs. Pam Kline, associate dean, and Rosanne Pruitt, Department of Nursing Science, received funding from the American Nurses' Foundation for an immunization project.

COLLEGE OF SCIENCES

The College of Sciences' research programs continue to grow with \$18 million in outside research funding. The college continues to cover 30 percent of the University teaching load.

Another successful graduate teaching assistant workshop was held for one week prior to the start of 1992 fall classes. For the second year in a row, the University's two outstanding graduate teaching assistants were selected from the College of Sciences. They were recognized at commencement activities in August 1992.

A cooperative agreement between Clemson and the University of Bradford, England, was signed by the two presidents and became effective in October 1992. It allows for the exchange of faculty and students and the development of joint programs in teaching and research to promote the advancement of science, technology and education. Coordination at Clemson will be implemented by Dr. Bobby Wixson, dean of the College of Sciences.

Ms. Betty Newton, curator of the Geology Museum (now located in room 221 Brackett Hall) has received specimen donations valued at more than \$110,000 in the last year.

The College of Sciences' advisory board met April 18 and 19, 1993, to discuss college strategic planning, budget status and ways to increase external funding, gifts or critically necessary instructional equipment. While at Clemson, the board met with college and University administrators and faculty to demonstrate the use of multimedia in instruction as developed by the Educational Instruction Technology Laboratory.

Dr. Marshall (Sonny) White, Jr., president, Chemicals Division, CIBA-GEIGY Corp. in Greensboro, N.C., and a member of the College of Sciences' advisory board, has agreed to serve on Clemson University's Primary Gifts Committee for 1993-94. The committee will meet quarterly in connection with the Clemson University Foundation Board.

A research-teaching collaboration has begun between the Department of Microbiology and the Greenville Hospital System through the Clemson University/Greenville Hospital System cooperative education and research agreement.

The 14th annual Biology Merit Exam was held on March 26, 1993, with more than 2,000 middle and high school students and teachers from South Carolina attending.

Hoffmann-LaRoche has donated hand-held calculators to the Department of Chemistry to be used by the undergraduate students.

Dr. Darryl D. DesMarteau, Tobey-Beaudrot professor of chemistry, has received \$85,000 from Ausimont for 1993. This is the seventh year of continuous funding from this industrial source and has resulted in 15 patents. Ausimont is headquartered in Milano, Italy. Over the life of this collaborative program, Ausimont also has supplied six Italian postdoctoral fellows at their expense.

Dr. Raymond C. Turner, professor of physics, has been selected as one of the three new Alumni Master Teachers. Dr. Turner previously was selected as the S.C. "Governor's Professor of the Year" and also received the Class of '39 Award for Excellence, both honors coming in 1993. It always is a pleasure to see recognition for excellence in teaching.

Dr. Mary Jean Harrold, assistant professor of computer science, has been honored by being selected for a National Science Foundation (NSF) Young Investigator Award which brings a total annual support of up to \$100,000 a year for five years. Her research will develop an environment and tools to assist users in analysis, testing and maintenance of c and c programs.

Fay D. Brown of Anderson, S.C., has been named director of development for the College of Sciences. She will work closely with the college's advisory board, faculty and administration to determine specific needs of the college and will research and develop resources to match these needs.

Department of Biological Sciences

The challenges to modern society are many. Informed decisions regarding health-related procedures, foods, preservation of biological diversity and waste dis-

posals require a knowledge of the biological parameters involved. We must insure that our graduates are prepared with the appropriate knowledge and skills to meet these intellectual challenges and play leadership roles in society. We must reach not only those students majoring in some aspect of biological sciences, but also those students whose only exposure to biological systems at the university level comes from their electives.

At the undergraduate level we have completely changed our curriculum to allow both the pursuit of more in-depth studies and, at the same time, allow for more breadth in the areas explored. A redesign of the lecture/lab combinations will allow the non-science major to explore more areas within biological sciences without having to take the laboratory sections. These changes have been approved by the University effective in the fall of 1994.

At the graduate level, a multi-college initiative has resulted in the implementation of a genetics graduate program that offers both the M.S. and Ph.D. degrees. The Department of Biological Sciences has continued our combined teaching and research efforts with the Greenwood Genetics Center and separately with the Greenville Hospital System. Dr. David Gangemi has been appointed director of the cooperative effort and has continued and built upon the efforts initiated by our department.

Research in the department during the 1992-93 fiscal year continued to increase, reaching the \$1.98 million expenditure level. The funding sources are very broadly based, ranging between huge federal government agencies such as NIH, USDA and DOE, to S.C. Wildlife and the Atlanta Zoo.

The plans for renovation of Kinard Annex are nearing completion. When renovations are complete, the University will have an excellent building for public display of animal, plant and geological diversity. This building will serve as an educational display area for the public and, at the same time, allow the department to better house and display our collections.

Biology Program

During the 1992-93 academic year approximately 5,000 students were enrolled in courses in the Biology Program. Nine lecture sections and 65 laboratory sections per week were taught each semester by faculty and graduate students from the Biology Program and departments of Microbiology and Biological Sciences.

Two faculty members conducted a workshop reunion at the annual meeting of The Association for Biology Laboratory Education in the Teaching of Investigative Laboratories, which was attended by 30 biologists from throughout the United States and Canada. Two others presented a workshop on graduate teaching assistant training at the same meeting. The 14th annual Clemson University Biology Merit Exam was conducted in April. Approximately 2,000 students and teachers attended. One faculty member has been selected by Wadsworth Publishers as author of a biology laser videodisc for General Biology and a Chemistry for Biologists series for HRM Media.

Several grants were refunded to faculty of the Biology Program during the 1990-91 academic year. These included a \$260,000 grant from the NSF for laboratory course development, continuation of a \$60,000 Undergraduate Faculty Enhancement Grant from the NSF, continuation of a \$200,000 Eisenhower Grant for the training of middle school science teachers, and a \$56,000 renewal of a grant from the U.S. Department of Education Fund for the Improvement of Post-Secondary Education. A total of six grant proposals were submitted by the faculty. Four were funded.

Scholarly activities carried on by the faculty included four published manuscripts, four nationally published laboratory manuals, and authoring of six instructor's manuals. A total of 20 papers were presented by faculty at national and regional meetings including the annual meetings of the National Association of

Biology Teachers, National Science Teachers Association, the American Association for the Advancement of Science and the Association for Biology Laboratory Education. One faculty member taught eight national biology advanced placement workshops. Faculty also continue to serve as reviewers for the NSF and various publishers of biology textbooks and laboratory manuals.

Department of Chemistry

The Department of Chemistry has made an excellent contribution to the teaching, research and service programs at the University. This past year more than 4,000 student credit hours were taught with fewer faculty due to the budget cuts. In addition, the department experienced its best year in obtaining external funding for research and teaching programs. The amount of research carrying indirect cost was substantially larger for chemistry than any other department at Clemson.

Faculty and staff changes include:

- Dr. Geldard retired from the faculty.
- Ms. Debbie Burrell joined the staff, replacing Ms. Stacy Murray who returned to school.
- Ms. Ellen Few resigned from the staff to take a position in Greenville and was not replaced due to budget constraints.
- Dr. Dill resigned from the faculty to take a position with a biotechnology company in California.
- Dr. Williams assumed the duties of associate department head.

Educationally, the department is teaching more students with less faculty than it ever has in the past. However, new innovations such as cooperative laboratories, multimedia lecture presentation, large-lecture writing projects and others have led to a higher level of enthusiasm for students taking chemistry.

Two faculty received awards this year. Dr. DesMarteau, Tobey-Beaudrot professor, received the Charles H. Stone Award denoting the top research program in the Southeast region of the United States. Dr. Robinson was awarded an Alexander von Humboldt Research Fellowship and will spend the spring semester in Berlin.

Research proposals were successful in many areas including the purchase of major equipment in the area of X-ray crystallography and mass spectrometry. Figures released by the Office of University Research show that chemistry is the top department in the University in new competitive proposals funded from last year.

A major effort in the department this year will involve the new initiative of the NSF in curriculum development. Next year, two or three proposals will be funded by NSF for \$5 million. We currently are preparing a planning grant proposal and will develop a comprehensive proposal during the spring. The large number of quality faculty and our recent notoriety in chemical education will have a very positive effect on our chances to bring this proposal to Clemson.

Department of Computer Sciences

The 1992-93 year was a memorable one for the Department of Computer Science. It marked the first year since its founding in 1978 that Dr. A. Joe Turner was not department head. In the many years that Dr. Turner was head, the department grew from approximately six faculty and three staff to approximately 23 faculty and eight staff; research grants and contracts grew from nothing to more than \$1 million annually; research publications grew from nothing to 46 papers per year; the department established all of its current degree programs (the B.S. and M.S. degrees in Computer Science in 1980; the B.S. in Computer Information Systems in 1983; the Ph.D. in Computer Science in 1984 and the B.A. in Computer Science in

1991) and the B.S. degree in Computer Science was included among the first 13 computer science programs accredited nationally by the Computing Sciences Accreditation Board in 1986 (this program has been fully accredited every year since then). Furthermore, by August of 1993 the M.S. program had become the second largest master's program at Clemson with 125 students (the MBA is the largest), and the Ph.D. program has 25 students, which is the largest this has ever been.

As soon as Dr. Turner stepped down as head, the department's fortunes turned for the worse, largely because of two consecutive years of 5 percent-level budget cuts. The department ended 1992-93 with three and one-half faculty positions, two computer systems staff positions and one administrative staff position unfilled, with little likelihood that any of these positions soon will be filled. In addition, Professor Page has taken a full-time position in the dean's office, and his position in the department will not be replaced. In spite of the significant losses in positions and budget, the department has moved ahead in research grants, contracts and publications.

Drs. Grossman and Madison continued to receive excellent funding from ONR for further developmental work on TECNET. This funding has continued for the past 11 years.

Dr. Peck continues to direct the impressive efforts at Clemson Apparel Research (CAR), which has become the high technology showplace of Clemson University. Drs. Pargas and Tagliarini also received funding from DLA for research at CAR.

Drs. McGregor, Turner and Harrold all had grants from NSF.

Dr. McGregor's grant was for hosting a workshop for graduate faculty concerning the laboratory approach to teaching computer science.

Dr. Turner received an addition to his current CISE grant to fund a workshop on the CISE educational infrastructure program. He also received another grant to host a workshop on curriculum development.

Dr. Harrold received a software capitalization grant for further development of an inter-procedural analysis system for C/C++ programs.

Dr. Geist has created the Avion Systems Lab with support from Data General, including donations of state-of-the-art equipment.

Drs. McGregor and Korson have been successful in developing their Object Technology Group with contracts from IBM and Bell Northern Research.

Dr. Westall continues to receive funding from NCR in Liberty, S.C., including a donation for SES workbench software use.

Dr. McGregor obtained a grant from DARPA to assist the department with the introduction of ADA into its curriculum.

And finally, Dr. Mary Jean Harrold has become the recipient of a prestigious, five-year National Young Investigator Award from NSF.

The Department of Computer Science had perhaps its most successful year in its history in terms of research publications in spite of its losses in faculty. Eleven of its 18 tenure-track faculty had three or more publications either published or accepted for publication; and four faculty had eight or more such publications (Drs. Harrold, S.T. Hedetniemi, Jacobs and Malloy). In a discipline in which two-to-three publications per year is considered to be very good, eight per year is considered to be exceptional.

Department of Earth Sciences

A significant milestone was reached this past year when the Department of Earth Sciences graduated its first student from the recently initiated M.S. degree program in hydrogeology. Total enrollment in this program increased to 10 students during this second year. The majority of the graduate students were supported by external research funds obtained by the graduate faculty. Most of the research was conducted in collaboration with Westinghouse Savannah River Co. scientists and engineers through the S.C. Universities Research and Education Foundation (SCUREF). By

the year's end three major SCUREF contracts were in place: "Establishment of a Field Geohydrology Experimental Site" (David Snipes, PI); "Hydraulic Properties of Aquifers" (David Snipes, PI); and "Development of Remediation Alternatives for Subsurface DNAPLs" (Ron Falta, PI). A crowning achievement of the fledgling hydrogeology program was the convening of the Clemson University Hydrogeology Symposium in September. More than 110 persons attended this conference, which featured talks by faculty members Dave Snipes, Ron Falta, Sally Benson and Wallace Fallaw and graduate students Will Kegley, John Daggett, Jerry Moore and Scott Brame.

The 1992-93 academic year saw another increase in the number of undergraduate geology majors, continuing the trend of recent years. The enrollment now is double what it was just five years ago. A heightened awareness of environmental problems has fueled this growth. As a result, teaching and advising loads of the geology faculty are up considerably. The department also is heavily involved in teaching earth science and physical science to elementary education majors. This effort has been greatly aided by a grant from the S.C. Commission on Higher Education (CHE) to fund "Full Circle Partnerships for Elementary Science Education" (John Wagner, PI). Dr. Wagner also received significant funding from CHE for a project entitled "SCMAPS Enhancement: A Statewide Field Course for Teachers."

Renovation of Brackett Hall virtually has been completed. The Department of Earth Sciences moved into its newly refurbished office and laboratory space in January. The move was accomplished relatively smoothly, with minimal disruption of academic programs. A permanent geochemistry laboratory to house the atomic absorption spectrophotometer, a dedicated computer laboratory for groundwater modeling studies, and an electron microprobe laboratory for quantitative mineral analysis are some of the major benefits of the renovation. A gift from Bob and Betsy Campbell allowed Earth Sciences to purchase an IBM RISC 600 computer system to aid in groundwater modeling analysis. The Geology Museum has been upgraded, and new collections donated during the past year were valued in excess of \$125,000. More than 6,000 persons visited this outstanding campus attraction in 1992-93.

Other noteworthy individual accomplishments include the following: John Wagner completed his Ph.D. dissertation at the University of South Carolina and was awarded the Ph.D. degree in May 1993. He received a "Community Service Faculty Award" presented by the Visions for Youth Program funded by the W.K. Kellogg Foundation. Wagner also received an award from the Clemson Innovation Fund for the establishment of a geographic information systems teaching laboratory. Richard Warner continued as PI on an NSF grant to study the "Magnetic Petrology of the Lower Crust." He was invited to present a talk at a workshop on "Effects of Chemical Change on Magnetization" in Santa Fe, N.M. Warner also was coauthor on two papers appearing in *Eastern North American Mesozoic Magnetism: Geological Society of America Special Paper 268*. Ron Falta had papers accepted for publication in *Ground Water* and *ASCE Journal of Environmental Engineering*. He also presented talks at the American Institute of Chemical Engineers 1992 summer meeting in Minneapolis, Minn., the 1992 Joint Conference on Hazardous Waste in Columbia, and the American Geophysical Union 1993 spring meeting in Baltimore, Md. Dave Snipes, Ron Falta, Sally Benson and graduate students Scott Brame, John Daggett and Jerry Moore all presented talks at the 1993 Southeastern Section Geological Society of America (GSA) meeting in Tallahassee, Fla. Undergraduate student Nick Kidd was selected by the U.S. Department of Energy to participate in its 1992 fall Science and Engineering Research Semester at Lawrence Berkeley Laboratory. Kidd also was awarded a Sigma Xi Grant-in-Aid of research and a GSA student research grant.

Educational Information Technology Laboratory

The Educational Information Technology Laboratory (EITL) was established at Clemson University in 1989 as a center to support science education through the application of electronic multimedia and advanced instructional technologies. EITL provides support for faculty wishing to incorporate advanced computer, video and communications technologies into their teaching. The group develops educational media (including graphics, animations, videotape or disc, audio data and text) and assists in the authoring of educational applications using these media. EITL also maintains and enhances its own proprietary software product, *InteractiVision*[™], which is used in Clemson classrooms.

During the year, 30 minutes of video animation were produced for Human Relations Media. These animations will be part of a training video presenting Basic Chemistry for Biology to high school students. The group also is working on a videodisc for Wadsworth Publishing Co. to accompany their college-level biology text. Enhancements to *InteractiVision* include the release of V2.5 and the incorporation of support for two graphics cards so that students need not see menu screens available to instructors. Commercial activities include interactive programming for Disney Stores and interactive graphics support for Burroughs Welcome at their recent trial on AZT.

The group presented papers at meetings of the Society for Applied Learning Technology, the Association for Educational Communications and Technology, the Association for Applied Interactive Multimedia, and the Higher Education Network Association. The director of EITL currently is president of AAIME and a member of the board of HENA.

EITL is committed to enhancing the learning environment by incorporating advanced technology and will continue to work at all levels within the University, community and state to accomplish this objective.

Electron Microscope Facility

The Electron Microscope Facility has acquired several new pieces of instrumentation. Thanks to the University Research Office and The Greenville Hospital System, we purchased the transmission electron microscope (Hitachi 600AB with Energy Dispersive X-ray attachment), which is installed and operating. We also accepted a donation from Scanner Corp. of a scanning electron microscope, which has become a valuable tool for teaching purposes. In addition JEOL USA made it possible for us to receive another transmission electron microscope which will be used specifically for the biologists, allowing the 600AB to be used by the engineering researchers. Currently, two grants have been awarded to the College of Engineering which will up-grade our facility with a scanning tunneling atomic force microscope as well as a new computer setup and X-ray system for an existing electron microscope. The equipment will be operational in the winter of 1994. To add to our success we had two students from the College of Engineering and the College of Agricultural Sciences receive national awards for excellence in microscopy. The facility will continue to grow and educate students and researchers with new and existing equipment, and we foresee next year even better than this year.

Greenville Hospital/Clemson University Biomedical Cooperative

The GHS/CU Biomedical Cooperative is now two and one half years into its five-year agreement, and during the period July 1, 1992 - June 30, 1993, the following activities were recorded:

- A permanent director was appointed and the Cooperative office and administrative team were created. The office staff includes an administrative assistant, Ms. Jenny Barden, and an accountant, Ms. Paula Arrant.
- More than \$150,000 in grants to support biomedical instrumentation and research was awarded to encourage collaboration between GHS staff and University faculty.
- A new course, "Biotechnology and Medicine," was developed to help residents and hospital staff keep abreast of the latest scientific discoveries and the impact which these technologies will have on the practice of medicine.
- A Biomedical Lectureship Series was initiated to stimulate clinicians to participate in ongoing research efforts and to initiate new ones. The first lecture in this series was presented by Dr. James Anderson of Case Western Reserve and was attended by more than 200 faculty and students from across campus. Dr. Anderson also presented grand rounds at the Greenville Hospital.
- The GHS/CU Biomedical Research Laboratory was established at Clemson to promote and facilitate research interactions between GHS staff and Clemson faculty. This facility is located in Jordan Hall and is open to all GHS staff and Clemson faculty working in the Cooperative.
- The first brochure describing the activities and mission of the Cooperative was printed and distributed to University faculty and GHS staff.
- Two post-medical graduate programs have been tentatively approved and are being submitted for formal approval. These programs are not new programs but existing Clemson graduate programs in Microbiology and Biological Sciences which allow GHS residents to receive credit for course work and research during their residency training.

In addition to the above accomplishments, the Cooperative has 1) initiated programs with the Greenville Chamber of Commerce to recruit biotechnology and health-related industries to the Upstate, 2) developed a rural health care delivery initiative which involves the Clemson Cooperative Extension Service, East Tennessee State University and the USC medical schools, and the Greenville Hospital, and 3) initiated a recruitment strategy which will bring outstanding biomedical researchers into the Cooperative.

Department of Mathematical Sciences

The Department of Mathematical Sciences continues to strive for excellence and innovation in teaching, research and service to Clemson University, the state and the nation. In teaching, the department accounted for nearly one-eighth of the total credit hour production of the University. The department awarded 30 bachelor's degrees, 30 master's degrees and nine Ph.D. degrees during this 12-month period. Our faculty had 54 research publications supported by 15 grants and contracts with a total award value of more than \$1 million. Funding sources included the National Science Foundation, National Institute of Standards and Technology, National Aeronautics and Space Administration, Office of Naval Research, Defense Logistics Agency, and S.C. Universities Research Foundation. The department has taken an important role in training secondary school teachers and developing classroom innovations that are receiving nationwide attention.

A major strength of the department is our diversity. Our curriculum, which includes traditional areas of mathematics as well as statistics, operations research and computation, has been cited as a model for the nation. The department was successful in recruiting two women mathematicians to join our faculty, resulting in fully one-quarter of our regular faculty being female. In contrast to many departments across the nation, we continue to be very successful in attracting native U.S. citizens to our programs (24 of 26 entering graduate teaching assistants representing 14 states). Our graduates find jobs in both industry and academia. Our faculty is ac-

tive in University committees and serve as editors and advisers for several national journals.

More than 100 of the nation's top mathematical scientists from universities, government and industry participated in the Conference on Graduate Programs in the Applied Mathematical Sciences hosted by the department. This conference was intended to help chart the future of graduate education in the mathematical sciences for the nation. It is indicative of the department's stature in the national mathematical sciences community that this important conference was held at Clemson University. Prior to the conference, several of the attendees participated in an assessment of the department's graduate programs. A leader of the assessment group began his report by saying, "Congratulations! While maintaining support of an aggressive M.S. program that (separately) we characterize as a paradigm M.S. and pre-Ph.D. program for the nineties, you have amassed a faculty and structured a specialized course work program that enables your Ph.D. graduates to be valuable research mathematicians in areas with proven value in applications."

In June, Clemson hosted an NSF-funded conference that showed 250 College Board Workshop leaders how to integrate the latest calculator and computing technology into the training programs they give for the 5,000 advanced placement calculus teachers throughout the country. The workshop was addressed by the president of the Mathematical Association of America and attended by many calculus reform leaders currently funded by the NSF. At the March meeting of the National Council of Supervisors of Mathematics, 1,500 school districts received video and printed instructional materials on how to present family workshops on the use of technology in mathematics instruction. These items were produced in a project sponsored by the Mathematical Association of America and directed by faculty from Mathematical Sciences. As part of the NSF Engineering Education Coalitions Program, a project directed through our department (and including personnel from the College of Engineering) is developing statistical training programs to meet national accreditation requirements for engineering programs. The Center for Excellence in Mathematics and Science Education continues to provide resources and training to enhance secondary education in South Carolina.

The department's Distinguished Visiting Professor series brought 10 nationally recognized mathematical scientists to Clemson to discuss current mathematical problems in industry and opportunities for university, industrial and government cooperation. Companies and laboratories represented included the Supercomputing Research Center, General Motors Research Labs, AT&T Bell Laboratories, IBM Research Center, Martin Marietta, National Security Agency, Toyota Institute, and National Institute of Standards and Technology. The annual Sobczyk Memorial Lecture was given by Leonid Khachiyan, a Russian mathematician responsible for the proof of one of the most important mathematical results produced during the past decade.

Especially in these times of diminishing financial support for higher education, the faculty of the Department of Mathematical Sciences is proud of its accomplishments and maintenance of the high standards set during the past several years.

Medical Technology Program

The Medical Technology Program completed another productive year of teaching, advising, administrative activity and club sponsorship. The program currently enrolls about 40 students. Seven students currently are doing their senior clinical year at our hospital affiliates, completing baccalaureate degree requirements for graduation. Three students have graduated in the last calendar year. The senior clinical-year students continue to excel on the national certification exam. All have been successful in finding employment in the profession. With serious nationwide shortages in the profession, the number and range of professional opportunities are large.

Senior-year clinical courses continue to be offered by hospital program affiliates. Formal affiliation programs are with the schools of medical technology at the Anderson Area Medical Center and the McLeod Regional Medical Center in Florence. Informal affiliations exist with the medical technology programs at the Medical University of South Carolina in Charleston and the Baptist Medical Center in Columbia. The Anderson program continues to help teach the introductory medical technology course taken by new majors.

With the advent of government restrictions limiting health care reimbursements to hospitals and other providers, many hospital-based programs in health education need to develop additional sources of funding for fiscal stability. Through the Medical Technology Committee, the University has instituted a plan whereby Clemson University provides a significant amount of support to the Anderson Area Medical Center School of Medical Technology for each Clemson clinical student in attendance. This agreement has been renewed for a second two-year period.

The current program coordinator continued to promote medical technology by group and individual presentations to students and teachers from around the state and by participation in the spring annual meeting of the S.C. Society for Medical Technology. The student medical technology club completed another successful year of activities which included presentations by speakers, service projects and attendance by several students at the annual spring meetings of the S.C. and N.C. Medical Technology Societies. The club once again has been funded by student government for the coming year.

Department of Microbiology

A notable development during the past year was the addition of a new professor to the faculty: Dr. J. David Gangemi, who also is director of the Clemson University/Greenville Hospital Alliance. Dr. Gangemi brings to the department a research program in animal virology, a major emphasis of which is the development and testing of drugs and modifiers of the immune response which have antiviral activity. Collaboration with the Hospital Alliance has led to the initiation of new research projects with clinical relevance: 1) examination role of *Helicobacter pylori* in the etiology of stomach ulcers and testing of a vaccine against this organism; 2) characterization of mechanisms of drug resistance in *Staphylococci* responsible for many hospital-acquired infections; and 3) examination of the role of genetic repair capacity as a factor in determining a woman's susceptibility to developing breast cancer. A course, "Biotechnology in Medicine," was offered for graduate students and Hospital residents. Dr. Khatib Jafri completed research for the M.S. degree and became a resident in internal medicine at Greenville Memorial Hospital.

Ninety-one students were enrolled in the B.S. degree program. Of these, 16 were on the dean's list, and five were on the president's list. Thirty students were enrolled in the M.S. program and 16 in the Ph.D. program. Six M.S. and two Ph.D. Microbiology degrees were awarded.

Departmental research was supported by: 1) a grant from USDA for studies of immune responses in channel catfish, 2) a University research award to study microbial breakdown and recycling of natural materials, and 3) a provost award to study mechanisms of carcinogenesis.

Dr. Stutzenberger continues to serve as senior editor of *Letters in Applied Microbiology*, and faculty have served on editorial boards of professional journals and/or review panels of USDA, NIH and FDA.

Department of Physics and Astronomy

During a year of budgetary gloom and cutbacks, there were a number of bright days where individual faculty received outside recognition for excellence in their teaching and research. Topping that list is Professor Raymond C. Turner who re-

ceived the 1992 S.C. Professor of the Year award from Governor Carroll A. Campbell, Jr. He also received the Clemson Class of '39 Award for Excellence Medal and was chosen by his colleagues for the rank of alumni professor. Professor Turner is famous for his studies and lectures on the physics of toys. In addition to advanced courses in physics, Professor Turner teaches the honors introductory course in physics and the introductory courses for engineering and science majors.

Professor Donald Clayton received a grant of \$180,000 from the Keck Foundation for the study of the origins of natural radioactivity in matter. This grant is in recognition of the fundamental theoretical studies in the origins of matter in the universe being carried out by Professor Clayton and his colleagues at Clemson. He also is a co-investigator of the OSSE Experiment in the Gamma Ray Observatory satellite, and he and the other members of the astrophysics group are active in the analysis of data from that instrument. He was a recent recipient of NASA's Achievement Medal and the Leonard Medal of the Meteoritic Society. Professor Clayton also teaches an introductory astronomy course in addition to advanced undergraduate and graduate courses in physics.

The department shops have begun preparing payloads for rockets and satellites as part of department research programs. Under a NASA grant to Professor Miquel Larsen, they are preparing canisters designed to release gases from rockets as part of studies of the physics of the upper atmosphere. The department head, Pete McNulty, and one of our visiting assistant professors, David Roth, received a NASA grant to build the space microdosimeter, an instrument designed to measure the radiation environments of space encountered by the FUSE (Far Ultraviolet Spectrometer Explorer) satellite, one of NASA's Explorer series of satellites. This production of flight hardware is a new activity of the department, but it is a necessary component of the department becoming a center for atmospheric and space physics. Professor McNulty also was appointed the technical chairperson of the 1995 IEEE International Nuclear and Space Radiation Effects Conference to be held in Madison, Wis.

The department is fortunate to have adjunct faculty who actively contribute to the research programs of the department. Two of our adjunct faculty, Professors Michael Nevitt and Malcolm Skove, along with Professor X.G Tessema and colleagues at S.C. State, have received a DOE grant of \$1.2 million to be shared between the two universities. We are happy to note that their colleagues at S.C. State, James and Linda Payne, both received their Ph.D. from our department.

The most unfortunate consequences of the recent budget cuts are the premature (in our opinion, not theirs) retirements of Professors Will Graben, Fred Keller and Carl Ulbrich. Professor Graben long has been an influential leader among the faculty, and through his excellent teaching in the advanced undergraduate and graduate courses, has strongly influenced every one of our graduates. Fred Keller is the author of one of the best-selling textbooks in Engineering Physics. It is in use at numerous universities across the world, and it has been a matter of great pride that many of Clemson's students have had him in class. He maintains high standards for his students and has remained one of our most popular teachers. Carl Ulbrich founded the department's Atmospheric Physics group and helped develop it into one of the strongest programs in the University. He also has been a dedicated and popular teacher, and he was undergraduate adviser to many of our majors in addition to guiding graduate students in their thesis studies. He served as acting head of the department during a critical transition period and was so fair and even-handed that he was asked to serve as acting head of one of the other departments in the College of Sciences. Graduate students in Atmospheric Physics travel to the places in the world where they are least likely to run into tourists. In the last few years they have been involved in experiments in northern Greenland, northern Alaska and the mountains of Peru.

Through the efforts of the entire faculty, the department has made considerable progress in developing its research programs despite the severe cuts in funding and

not being able to fill permanent positions. The situation is illustrated below in the table prepared by Professor Turner, our representative to the college's strategic planning committee. Since 1983 the grant support from federal sources has increased by a factor of eight, while our teaching responsibilities have increased by almost 50 percent. During that time the number of permanent faculty has decreased by 25 percent. The department is at a critical junction, and a serious review of our situation and our future is required.

Year	Permanent Faculty	Temporary Faculty	Total Faculty	Student Credit Hours	Grant Funding
83-84	22.5	2	24.5	12,631	\$200,143
84-85	23.5	3	26.5	12,521	119,377
85-86	22.5	1.5	24	12,258	339,845
86-87	22.5	1	23.5	12,609	314,623
87-88	20.5	3	23.5	13,737	225,344
88-89	24.5	1	25.5	15,026	757,126
89-90	24	1	25	17,160	888,550
90-91	23	2	25	17,156	1,119,904
91-92	22.5	3	25.5	16,872	1,171,424
92-93	20.5	4	24.5	17,529	1,600,988
93-94	17	4	21	NA	NA

DIVISION OF AGRICULTURE AND NATURAL RESOURCES

Change has been the watchword within the Division of Agriculture and Natural Resources. Fiscal challenges required streamlining efforts, strategic planning and effective partnerships with industry and other government agencies. But these new approaches to old problems will strengthen the division's research and programming efforts.

The College of Agricultural Sciences' strategic planning committee has identified six key focus areas for upcoming years: undergraduate and graduate education; sustainable agricultural enterprises; the environment, food quality and safety; facilities, communities and rural development; and the organization and management of the college. These areas should help the Clemson Extension Service, the S.C. Agricultural Experiment Station and the Office of Academic Affairs build stronger linkages with non-traditional agricultural, environmental and community groups.

Clemson's new \$1 million, 5,000-square-foot Sonoco Packaging Science Laboratory was completed and dedicated this year. The facility, which contains some of the world's most sophisticated packaging equipment, was built in partnership with industry and is the only public-access laboratory of its kind in the Southeast. The Sonoco Packaging Lab is one of the best-equipped packaging research and teaching facilities in the world.

Clemson's 4-H and Youth Development Department, the S.C. Agricultural Experiment Station and the College of Education teamed up to create and implement the PEAK (Professional Educators' Access to Knowledge) Institute, a summer enhancement program for S.C. teachers and Clemson Extension agents. The program is designed to improve science instruction in the classroom by providing teachers hands-on training from scientists. The \$307,000 project was one of 16 funded through the U.S. Department of Energy by the federal Coordinating Council for Science, Engineering and Technology's summer enhancement program. Clemson was the only land-grant university to receive a grant.

In May 1992 the Commission on Higher Education approved for Clemson University an inter-college graduate genetics program. This program, which will include concentrations in plant, animal, microbial and molecular genetics, was approved upon recommendation of a College of Agricultural Sciences committee in fall 1988. As a result, students in the College of Sciences and the College of Agricultural Sciences currently are enrolled in master's and doctoral programs in genetics.

Last February the director of the Clemson Extension Service announced an administrative reorganization designed to streamline program delivery and reduce middle management within the organization in fiscal 1993-94. The re-organization is expected to save Extension an estimated \$300,000 a year.

With the success of the state's boll weevil eradication program, Clemson's Department of Plant Industry began making plans this year for the containment phase of the program. This effort includes monitoring the effectiveness of the eradication phase and using traps to keep the boll weevil out of S.C. cotton fields. Since the eradication program began a decade ago, S.C. cotton acreage has more than doubled.

COLLEGE OF AGRICULTURAL SCIENCES

Academic Affairs

The academic mission of the college is to provide formal and informal educational opportunities for individuals at the undergraduate and graduate levels of study, and to produce the expertise and leadership needed for further advancement and success of the agricultural industry. The college currently offers 11 undergraduate degree granting programs focusing on Agricultural and Applied Economics with an option in Community and Rural Development; Agricultural Education; Agricultural Mechanization and Business; Agronomy; Animal, Dairy and Poultry Sciences (Animal Industries); Aquaculture, Fisheries and Wildlife Biology; Entomology; Food Science with a minor in Nutrition; Horticulture with an option in Turfgrass Science; Packaging Science; and Plant Pathology. Graduate programs offered by the college include a focus on discipline and interdisciplinary orientations at the master's (M.S., M.Ag., M.Ag.Ed.) and doctoral (Ph.D.) levels. Graduate studies are available in Agriculture; Applied Economics; Agricultural Education; Agronomy; Animal and Food Industries; Animal Physiology; Aquaculture, Fisheries and Wildlife Biology; Entomology; Environmental Toxicology; Food Technology; Genetics; Horticulture; Nutrition; Plant Pathology; and Plant Physiology.

Enrollment in the college continues to increase, reaching a 10-year high of 1,143. This represents an overall increase of 11 percent when compared with last year, with a 13 percent increase in undergraduates and a 6 percent growth in graduate students. During FY '92-93, the University imposed an enrollment cap on entering freshmen and increased requirements on transfer students. The undergraduate programs in Animal Science; Aquaculture, Fisheries and Wildlife Biology; and Horticulture continue to benefit from student interest, which is reflected in their number of majors with 188, 140 and 109 respectively. Graduate programs in Agricultural and Applied Economics (46 students) and Environmental Toxicology (32 students) demonstrate the highest enrollments. Experimental Statistics courses both at the undergraduate and graduate level continue to show the highest demand, having delivered 2,685 student credit hours.

Placement activities coordinated in the college included hosting 28 major agricultural companies on campus. This number represents a 200 percent increase when compared with previous years. There were 153 interviews with job offerings ranging in salary between \$18,500 and \$36,500.

Administratively, the department head in Agricultural Education resigned; an acting head in Experimental Statistics was continued; and five faculty with teaching appointments retired. An instructor in Experimental Statistics was hired in a non-tenure track position to address the increasing teaching demands. No other vacancies were filled. The budget again was reduced by 2.1 percent during this fiscal year.

Teaching awards were received by several faculty in the college. Dr. Albert Martini, professor of Agronomy and Soils, received the Outstanding Teacher Award presented by the Agricultural Student Council. Dr. George Skelley, professor of Animal, Dairy and Veterinary Sciences, received the Distinguished Teaching Award given by the American Meat Science Association. Dr. Kandice Kahl, professor of Agricultural and Applied Economics, received the 1993 NACTA Teaching Award. Dr. Judy Caldwell, associate professor of Horticulture, was named a Kellogg Fellow by the Kellogg National Fellowship Program. Professor Mary Haque, Horticulture, received the Community Service Faculty Award.

Comments on Departments

Agricultural and Applied Economics. Employment opportunities are excellent in Agricultural Economics and Community and Rural Development with 75 percent of the graduating seniors employed. A new thrust in Health Care Economics is under way to complement programs in the College of Nursing. An agribusiness focus is being offered in conjunction with Clemson's International MBA program in Pordenone, Italy.

Agricultural and Biological Engineering. The revised curriculum in Agricultural Engineering has been positive in attracting new students and in obtaining good jobs in industry following graduation. In preparation for the ABET review, faculty are evaluating their programs and activities. All graduates have demonstrated capabilities for identifying and solving real world problems. The recent retirements in the department have impacted their programs. No vacancies were filled due to budget constraints.

Agricultural Education. In addition to offering an undergraduate and graduate degree program, faculty have been very active in in-service training and continuing education for educators. Also, faculty have continued to offer preservice teacher education. Faculty continue to explore the expansion of their curriculum in agriculture communications and information systems. In August 1993, the department head resigned to accept another position. Also, a faculty member retired. No vacancies have been filled due to budget constraints.

Agronomy and Soils. Faculty developed a course on integrated assessment of agricultural and environmental issues utilizing case studies. This team-taught course with faculty in Agricultural and Applied Economics facilitates team-oriented problem solving activities. In another course, a computer assisted instruction program in genetics assisted students in understanding complex and abstract issues. This instruction program significantly impacted students' academic performance.

Animal, Dairy and Veterinary Sciences. The department leads the college in the number of undergraduate majors, with 188 students and an estimated 230 majors for FY '93-94. Three options are provided to students which include: Pre-Vet and Science; Business and Production; and Meat and Dairy Foods. An undergraduate manual has been developed by faculty for students and their parents to enhance their communication of the department's programs and activities.

Aquaculture, Fisheries and Wildlife. The second largest enrollment in the college's academic programs is reflected in Aquaculture, Fisheries and Wildlife. There were 140 students in this program which reflected a 17 percent increase when compared with last year. The master's program is capped at 30 students because of current resources both in personnel and facilities. The curriculum was revised last year to address the needs of industry and enhance employment opportunities. Several new courses were introduced which included a popular topic on conservation biology.

Entomology. Undergraduate education is a significant component both in and outside of the classroom. Even though the number of undergraduate majors is small, more than 300 students elected to take courses in Entomology. A new course in Environmental Entomology was introduced along with two other courses. The quality of their graduate students is reflected in three awards given to their students by the Entomology Society of America. Faculty are involved with the Governor's School for Science and Mathematics along with high school science fairs.

Environmental Toxicology. This relatively new program had 32 students enrolled last fall and estimates enrollment of 50 students for the 1993 fall semester. Last year, eight students completed their degrees. Several new courses were developed with a focus on sediment toxicology and modeling ecotoxicology. Significant support for the graduate program comes from extramural funds.

Experimental Statistics. This department generates more student credit hours than any other department or program in the college. There was a 30 percent increase when compared with last year, which primarily is observed at the undergraduate level. Students from several colleges have elected to take Experimental Statistics courses. A new faculty member was hired to address the high student demand for these courses.

Food Science. Renewed interest in publicizing career opportunities in food science is under way. A booklet on laboratory food science experiments is being distributed to high school science teachers. A faculty member in Nutrition received the Distinguished Service Award given by the S.C. Dietetic Association. The Packaging Science Program continues to grow in student numbers with 78 students currently enrolled. Their graduates receive the highest paid jobs in the college, i.e. \$36,500. Students are encouraged to participate in internships or co-op positions. The program has received \$2.4 million and is recognized by the industry as one of the top three packaging education programs in the United States.

Horticulture. The combined programs in Horticulture and Turfgrass have the third largest enrollment in the college. Innovative courses in landscape design have involved several communities, i.e. Orangeburg, Sumter, Clemson, Seneca and Charlotte. Faculty continue to receive recognition for their excellence in teaching and community involvement. This year, the Kellogg Foundation recognized a faculty member. Special efforts are being focused on a distance degree program with Horry-Georgetown; enhancement of articulation involving transfer students from Spartanburg Technical College; and an international exchange program involving France and England.

Plant Pathology and Physiology. The graduate programs are the primary focus in this department, which currently has 20 students enrolled. Many of these students are involved in the interdisciplinary Plant Physiology program, which includes students from two colleges. Two faculty left the department because of retirement and acceptance of another position.

Poultry Science. The S.C. Poultry Federation has provided significant scholarship support to undergraduates. A recent graduate competed successfully for a position with American Cyanamid among 250 applicants. Several initiatives in course presentation and subject matter have been undertaken. An effort to enhance the linkage between graduate education and industry will be initiated this year.

SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION RESEARCH SYSTEM

The S.C. Agricultural Experiment Station Research System, based at the Clemson campus, consists of laboratory and field facilities at Clemson and at four research and education centers across the state.

The system utilizes the expertise of scientists throughout the University to conduct the state's mission-oriented research in food and fiber production, natural resources and the environment. The system's facilities provide indoor and outdoor laboratories for scientists in each of the departments described in this section.

The Simpson Experiment Station near Pendleton serves as an outdoor laboratory for researchers and faculty on the Clemson campus. Research programs also are conducted at the following facilities: the Edisto Center in Blackville, the Sandhill Center near Columbia, the Pee Dee Center in Florence and the Coastal Center in Charleston.

These diverse geographic locations make it possible for researchers to conduct studies and carry out experiments relating to growers and crops in several areas of the state, allowing for the special circumstances and conditions of the different soils and climates.

The Experiment Station continues to adapt its research to the needs of the state's agricultural community and meet the needs of the rapidly expanding turfgrass and ornamental industries.

We also are conducting cooperative research with other states to avoid duplication and to build on the foundation of information acquired through other research programs.

The following summary is a capsule review of the extensive research programs under way in a number of areas.

Agricultural and Applied Economics

Research in the Agricultural and Applied Economics Department focuses on four key areas: (1) increasing profits from farm products, (2) making S.C. agriculture more competitive relative to other U.S. regions and in international markets, (3) predicting effects of U.S. government fiscal, monetary and farm policy programs on S.C. agriculture and rural areas, and (4) making energy-efficient and environmentally safe use of natural resources.

More than 80 percent of S.C.'s total land area is devoted to farming or forestry. South Carolina ranks second (behind California) in freestone peach production, third (behind North Carolina and Kentucky) in tobacco production, and third (behind California and Florida) in fresh market tomato production. Cotton acreage has increased greatly in the past four years — from 118,000 in 1989 to more than 200,000 in 1993.

Around 25 percent of the state's land area is defined as "wetlands." Aerial photography in the greater Charleston area indicates continued conversion of "wetlands" to urban uses, at least since 1970. In contrast, other wetland research indicates "political willingness" to increase acreage of publicly owned wetlands.

S.C.'s population increased 11.7 percent from 1980 to 1990 — a gain of 364,883 — making the 1990 total population 3,486,703. Urban population in-

creased most rapidly — 60 percent — from 1,189,757 (1980) to 1,905,740 (1990). Rural nonfarm population decreased 18.4 percent, from 1,878,468 (1980) to 1,532,398 (1990). Rural farm population actually declined by 9.4 percent, from 53,595 to 48,565. The farm population now comprises only 1.4 percent of the total population in South Carolina.

In 20 of S.C.'s 46 counties more than 70 percent of the population is rural (nonfarm or farm). These counties have: (a) fewer than 50 persons per square mile, (b) experienced population decline since 1980, (c) more than one-third of all families headed by one parent, (d) a per capita personal income of less than \$11,500 per year, (e) infant mortality greater than 14 deaths per 1,000 births, and (f) a "dangerous crime index" of greater than 515 (the average index for all U.S. rural counties is 415). It is geographically and economically difficult to provide and maintain a viable infrastructure in these counties.

Surveys conducted in four rural counties reveal that up to 25 percent of the rural residents would move elsewhere to obtain useful employment if they could acquire enough funds to move.

During the 1980s, infrastructure services in S.C.'s rural areas (including services from water and waste facilities, highways and public educational institutions) have declined significantly. In contrast, services in most suburban and urban areas (including Columbia, Greenville, Spartanburg and Charleston) continued to improve. Nine rural counties and 101 rural municipalities experienced population loss during the 1980s.

The impact of locating foreign-owned manufacturing (such as BMW) in South Carolina remains a lively topic. Recent research shows that foreign and domestic-owned manufacturers generally have similar impacts on local economies in terms of inputs purchased and occupational needs.

Recent research shows that the proposed North American Free Trade Agreement (NAFTA) should help increase fruit and vegetable production in the Carolinas and Georgia. Peach production, as a result of NAFTA provisions, should increase by about 1 percent; cucumber production should increase by 2 percent. Export earnings, as a result, should increase, and retail prices of peaches and several vegetables (including cucumbers) should decline.

Agricultural and Biological Engineering

The mission of the Agricultural and Biological Engineering Department is to provide the engineering input for the management of agricultural and biological systems and human and natural resources for effective and efficient production, processing, storage, distribution and utilization for the food and nonfood needs of society. Four of approximately 40 active research projects will be highlighted in this report.

Energy is being recovered from a covered lagoon at a S.C. meat processing facility. The cover traps the biogas (methane and carbon dioxide) so it can be used as a supplemental energy source. Heat exchangers are used to recover heat energy from the burning of the biogas. The heated water from the heat exchangers is used in various locations within the meat processing plant.

Alternative uses for corn and soybeans have been explored to produce biodegradable packaging films. The plastic and paper packaging materials result in a great deal of solid waste. Various formulations of corn and soybean proteins have been developed that will produce films with the desirable characteristics of strength, transparency, gas transmission, flexibility and water vapor permeability. The intent of the research is to produce films that will replace plastic in fast food wrappers, thus allowing the waste to be composted and completely recycled.

Determining contamination of groundwater supplies is of vital importance to South Carolinians. One technique with great potential is the use of electromagnetic conductivity readings. This rapid and economical technique will give an indication of elevated soil conductivity readings without having to install expensive ground-

water monitoring wells. So far, the technique has been used to determine seepage from animal waste lagoons in the Carolinas, Georgia and Missouri. The results from this study will be useful to various state and federal agencies, the Extension Service, livestock producers and groundwater researchers.

Poultry and egg production is a major agricultural enterprise for South Carolina and the entire Southeast. To do this in an efficient manner, the proper environmental conditions must be maintained. Research is being conducted to develop an index for the thermal environment of brooding-age chickens. This includes measuring temperature, humidity and air velocity in addition to measuring the response of the brooding chickens.

Agronomy and Soils

Faculty in the Agronomy and Soils Department are responsible for research in plant, soil and environmental sciences. This includes agroecology, forage production, small grain and soybean cultivar development, basic plant genetics, weed ecology and management. In addition, faculty conduct a variety of soil science research related to agricultural and environmental issues.

The department conducts several biotechnology activities related to plant and microbial genetics. DNA marker-based technology is used to enhance the selection process in plant breeding and for application in the control of soil and rhizosphere microbial processes. One broad objective is to identify mechanisms responsible for and to isolate genes responsible for resistance to biotic and abiotic stresses. The goal is to enhance the productive efficiency of plants through enhanced plant cultivars.

Research in weed science is directed at herbicide resistance and better ways to manage troublesome weed populations. A major objective is the reduction of herbicide use through correct identification of weeds, application of control measures at the most critical stage of the weed's life cycle, more direct applications, and more effective use of mechanical methods.

Cropping systems and agroecology emphasize more effective management of commercial fertilizers and proper use of soil tests. Research in soil sciences includes studies of water movement, effects of soil morphology on water and chemical migration, mutualistic relationships between soil organisms and plant roots, and of the basic character of S.C. soils.

Environmental sciences research relates to practical problems associated with the sound management of nonhazardous wastes, such as municipal and industrial sludges, through land application. Faculty currently are working with poultry, municipal, textile, food processing, electric utility, nuclear and the wood products industries. Basic research on effective management of the vadose zone to minimize groundwater impacts associated with landscape disturbances provides an undergirding for the work in waste management.

Animal, Dairy and Veterinary Sciences

The Department of Animal, Dairy and Veterinary Sciences carries out research, teaching and Extension work that focuses on beef and dairy cattle, swine, horses, sheep and goats. Personnel in the department are educated in the areas of animal breeding, reproduction, nutrition, dairy products, meat science, dairy and livestock production and veterinary science.

Research focuses on seven discipline areas: breeding and genetics, reproductive physiology, veterinary science, production, animal nutrition, meat science and dairy products. The department is increasing its involvement in basic biotechnology research and desires to maintain a balance between basic and applied research. Team research both within and outside the department and college is utilized and publica-

tion in both peer-review journals and trade publications is used to communicate scientific results.

Research shows that the drug domperidone shows great potential in treating the symptoms of fescue toxicity observed in pregnant mares. Past research at Clemson has shown that mares that feed on toxic fescue do not produce milk, have prolonged gestation periods, experience foaling difficulties, and may give birth to dead foals. Some mares die from these complications. When the drug was given orally to mares 30 days before foaling, the toxic symptoms were alleviated.

Another research project hopes to improve reproduction in food animals. Researchers discovered that a critical fat level is needed for beef cattle to be reproductively efficient and that corpus luteum function (what maintains pregnancy) is compromised when animals are underfed.

Feeding protected fat to lactating dairy cattle did not significantly improve lactation during either hot or cool months nor did it have any effect on milk composition.

Researchers are establishing inexpensive, workable swine farrowing and nursery buildings to take advantage of S.C.'s favorable environment. These houses will be compared with environmentally controlled buildings to assess productivity and healthiness of animals, increasing profitability to state swine production.

A system has been established for collecting and culturing oviductal epithelial cells to form a monolayer and for collecting the conditioned media from the cultures. In vitro fertilized embryos developed to blastocyst when cultured with epithelial cells. Preliminary data indicate that in vitro fertilized embryos also will develop to blastocyst when cultured in only conditioned media. The next step of this research is to identify the growth promoting factors present in the conditioned media.

Research is under way on the effects of stress and dietary and environmental toxins on the immune response to infectious disease and cancer. These studies have used diverse animal species including cow, rabbit, chicken, catfish, shark, skate and alligator.

Other areas of research include: development of rapid assay systems for milk spoilage organisms, isolation and characterization of embryonic separation and identification of immune cells in vertebrates; and development of analytical procedures for natural immune-modulating compounds in milk and soy-based products.

Research continues in the development of improved methods for maintaining the safety of foods and the environment. Studies are under way to isolate, by a novel approach, a food-grade bacteriocin capable of inhibiting and/or destroying *Staphylococcus aureus*.

An interrelated group of research projects involves using ozone as an alternative to chlorine and other halogen sanitizers. Chlorine from food processing plants and other facilities is extremely toxic in lakes, rivers and streams. Environmental authorities are considering banning chlorine by the year 2000. However, food processors must have effective sanitizers to prevent food contamination during processing. Therefore, a unique alternative is being investigated.

Recent research indicates that ozonated water effectively destroys dairy spoilage bacteria. Further research is under way to determine the safety of ozone to humans and the environment. If safe and effective, this process could be of tremendous benefit to food processors. Ozone is easy and inexpensive to generate, and after acting on organic material, ozone degrades back into molecular oxygen. Thus, no persistent toxic residues would remain to contaminate the environment.

Ozone also is useful in oxidizing waste materials. Research is under way to determine if ozone would enhance biological degradation of waste materials on a dairy farm.

Research efforts have focused on the relationship of live animal genetics, performance and nutrition as to the amount of lean high quality meat that is produced. Major efforts in beef cattle research are concentrated on identifying genetic components that relate to carcass composition and with the ultimate advantage of producing more lean and less fat per animal unit.

Major efforts in swine research are concentrated on identifying genetic and nutrition components that contribute to a high percentage of lean and a low percentage of fat. Quality meat production has become a goal of animal production because of this research. Other studies involve low fat sausages and cooking procedures for beef roasts.

Aquaculture, Fisheries and Wildlife

The effect of disking fallowed fields to provide food for bobwhite quail was studied in the Piedmont and Coastal Plain of South Carolina.

In the Piedmont, food values increased one year after treatment while control plots showed no increase. Annual March disking extended the increase into the second year in the Coastal Plain. No significant differences were found among sampling periods regardless of treatment, and disking alone is not recommended for food plot establishment in long-term agricultural fields there.

However, disking in the Coastal Plain may provide other habitat benefits, especially brood-rearing habitat. Seed samples showed that very few plant species volunteered that were not already present in the seed bank or as standing vegetation. Relative food value of standing vegetation and costs of planted food plots should be the primary factors in determining whether to implement disking fallowed fields as a substitute for planted food plots.

Using state-of-the-art molecular genetic techniques, reintroduction and translocation strategies were determined for the endangered red-cockaded woodpecker.

Crawfish production in deep and shallow earthen ponds was evaluated, and findings showed that production was significantly greater in deep ponds than in shallow ponds. Water quality was similar in the two pond depths. Dissolved oxygen decreased as the harvest season progressed. The most noticeable decline in dissolved oxygen occurred when water temperature reached 13 C. The size of the harvested crawfish also decreased as the harvest continued. The addition of supplemental feeding moderated this decrease in crawfish size.

Crop depredation by deer in South Carolina has been addressed by a multifaceted team approach. One approach is a community effort where all stakeholders are participating in a research project to reduce crop damage by lowering the number of deer through recreational hunting. Fields are being monitored for damage as deer numbers are being reduced over a three-year period. Results will help determine the optimal number of deer in an agricultural setting as well as an approach where all interested parties work together in a community effort to address a common problem of too many deer. Direct impacts will include a reduction in deer damage to agricultural crops, improvements in deer health conditions, and lowered deer-vehicle accidents.

Aquaculture research was highlighted by studies to determine the relationship between stress and disease resistance in channel catfish. Results of these studies will provide the basis for developing better culture methods. A second line of fin-fish research continued the project to determine environmental requirements for hybrid striped bass. This year the effects of environmental calcium on production characteristics were determined.

Entomology

The major thrust of research in the Entomology Department continues to be the development of environmentally acceptable methods for combating harmful insects. This approach is even more important with the increased concern about pesticide residues, especially in the food supply of children. Strategies under consideration now include biological control, resistant plants, cultivation practices and genetic manipulation as well as reduced chemical insecticides.

A study of doublecrop tillage practices on cultural control of Hessian fly in

wheat showed for the first time that fall tillage actually can increase emergence of the pest. That is, more tillage isn't better, contrary to long-established practices and beliefs about fall cultivation and insect control.

Research data on control of insect pests of peanuts indicate an interaction of soil insecticides and ergosterol biosynthesis inhibitor fungicides. This new class of fungicides will have the unexpected result of reducing prophylactic insecticide application (\$148/acre difference in net return).

Thrips are significant early season pests on cotton. A two-year study of alternate hosts indicated that densities of immature thrips were high on wheat, cotton and wild mustard. Data indicate that wheat and wild mustard may be important reservoirs for thrips populations which subsequently migrate to cotton.

Additional research on the adipokinetic hormone that is responsible for maintaining the long duration flight behavior of the velvetbean caterpillar revealed that the action of the hormone depends on adult age and reproductive status. It also is influenced by larval population density and phase polymorphism. A better understanding of the physiology of this hormone might aid in preventing damage from this insect.

The Charleston Harbor Project made an inquiry concerning the impact of agricultural runoff into the harbor. An entomologist who has been active in an interagency Coastal Pesticide Advisory Committee — a group that studies issues and events that cause pesticide-related pollution in estuarine environments — will make recommendations on needed research.

Significant progress was made in the Host Plant Resistance Tobacco Workers Group between entomologists, agronomists and chemists from several states.

Patent rights have been applied for in a cooperative effort with USDA-ARS to patent sucrose esters extracted from tobacco plants as potential insecticides for control of aphids and whiteflies. Laboratory bioassays also have shown insecticidal activity with several other plant extracts against tobacco budworm larvae.

Rearing techniques have been developed for an imported wasp that parasitizes the beet armyworm. The beet armyworm was successfully parasitized by laboratory-reared wasps in cotton in two regions of the state. About 80 percent of caged armyworm larvae died of parasitization and the parasitoid completed its life cycle in the field.

Food Science

Corn zein coated paper has been produced in the laboratory, and its packaging-related properties have been evaluated. This material has good grease barrier and heat seal properties. It has moderate resistance to moisture permeation. The expected high oxygen barrier properties, however, have not been attained. Corn zein coated paper has advantages over polyethylene coated paper since it is edible to ruminant animals.

Preliminary results indicate that harvesting Redhaven peaches at color chip 5 instead of color chip 3 offers the best potential for consumer-preferred high sweetness levels and resistance to vibration bruising. There is a significant difference in vibration bruising resistance of color chip 3 peaches and color chip 5 peaches, indicating the need for improved packaging for distribution of color chip 5 peaches.

Improvements in producing thermoformed containers for microhydroponics applications include an improved method of sealing microporous polyethylene film in the bottom and on the sides of heat-sterilizable plastic tubs.

Low oxygen transmission rates of packaging films decreased the rates of loss in color characteristics of turkey bologna. This is important basic information because color "fading" is a major problem of quality loss for many cured meat products in the consumer market.

Marinades are being applied to many meat products in the retail product and food service product sectors today. The acidity of the marinade and the salt used for flavoring accent interact to affect meat moisture retention through cooking. Gener-

ally, acidic (vinegar-type) marinades have been found to increase moisture retention while added salt reduces final product juiciness.

Work was concluded on modified atmosphere packaging of fresh, shelled green lima beans. The results indicated that using sealed bags with high oxygen permeability (or small perforations) and storing at low temperatures could preserve the fresh beans for six to eight days.

Significant progress is being made in the development of edible films and coatings made from corn, wheat and soy proteins. Laboratory methods for producing these films have been developed, and the properties required for packaging purposes (physical properties, oxygen and moisture vapor transmission rates, gauge, etc.) have been measured.

Work now concentrates on improving those areas (especially moisture vapor permeability) where these films are not competitive with films produced from conventional polymers. Significant improvements in water vapor barrier properties have been achieved by modifying the protein structures and by using laminations of different edible films.

Horticulture

The Horticulture Department's mission is to promote personal and professional growth through the discovery, communication and application of horticultural experiences, knowledge and scholarship.

Our work fosters environmental stewardship while improving the economic well-being, health and quality of life for all. Undergraduates, graduate students, members of the horticulture industry and the consuming public are benefactors of these research and educational efforts.

The following items are research highlights from the past year.

A commercial planting was established as an advanced test prior to the release of a new rootstock variety that shows resistance to peachtree short-life, the most devastating disease in peachtree production.

Construction of the new Musser Farm facilities near Clemson is near completion. Buildings include a security residence, a main building (for farm office, laboratory and work space, fruit processing, including a computerized grading line and cold storage), and an equipment shed/shop building. Other plans include building a pond and irrigation system, a pesticide storage and handling building, and purchasing research and field equipment.

Integrated Pest Management (IPM) funding was obtained to determine the feasibility of establishing nimblewill as a ground cover in peach orchards. Plots have been established in Edgefield, Spartanburg and at the Musser Farm to determine practical methods of establishing this grass in orchards from seed. Nimblewill is difficult to establish in most S.C. peach orchards, but it has potential as a non-chemical control of ring nematode. The ring nematode has been associated as a causal factor in death of peachtrees due to the short-life problem.

Cultural practices are being evaluated to reduce chemical and labor inputs into peach orchards. Several training systems are being evaluated for efficient capture of light and fruit quality factors. Results over three years show that high intensity systems, such as Y-trellis and Central Leader, have advantages in management requirements, fruit quality and consistency of production over the traditional open center system.

Studies suggest that root pruning trees in the orchard may be a practical and nonchemical practice for reducing excessive shoot growth after crop reduction due to spring frosts. Root pruning also has reduced the amount of summer and winter shoot pruning needed.

AAC and Chang Ji farm administrators from China met with the University administration and private seed companies regarding continued collaboration on research on generation of new watermelon and melon hybrids and subsequent increase in hybrid seed. The advantages of increasing the seed there are the same as

for hybrid seed production — well-trained labor, reasonable costs, isolation in an environment with minimal cucurbit diseases.

With the recent discovery of trehalulose as a major sugar in sweet potato whitefly honeydew when feeding on cotton plants, horticulturists have made significant progress into the amelioration of stickiness associated with sweet potato whitefly honeydew deposits. This thrust has led to strengthened ties with basic researchers at the USDA and to the awarding of a new grant in alternative vegetable pest control measures.

All of these programs are helping establish Clemson as a leader in research dealing with this serious insect pest. This effort will greatly improve our knowledge of the basic biology of this pest and may lead to novel, biologically sound control techniques.

All four cultivars of centipede grass planted at Clemson in early summer 1989 survived the winter of 1992-93. Three of these (Oklawn, Tenn Hardy and TC312) are reputed to be winter hardy. They are being compared with seeded common centipede. Oklawn and Tenn Hardy must be planted vegetatively. TC312 is a seeded cultivar from the USDA Experiment Station, Tifton, Ga.

In the USDA-funded project, Alternative Cropping Systems, Clemson horticulturists are cooperating with colleagues at N.C. State University and the University of Georgia to study plant nutrient cycling and vegetable crop responses to reduced tillage. This involved planting sweet potatoes and cucumbers into standing cover crops of crimson clover and wheat. This study included measuring nitrate movement in the soil as well as nutrient uptake by the growing crops. Another aspect of the project evaluates pea beans, long radishes and onions as potential crops for the Pee Dee area.

A research program has been initiated with funding from the USDA on alternative pest control methods for vegetables. This is in conjunction with the Plant Pathology and Entomology departments. The objectives are to: develop and evaluate microbial pest control agents to control plant pathogens and insect pests of vegetables; develop innovative cultural practices for vegetable production systems in South Carolina that reduce the amount of chemicals sprayed on plants; assess the role of indigenous predators, parasites and pathogens in controlling pests; and to consider the presence of natural enemies in management decisions.

Plant Pathology and Physiology

The Plant Pathology and Physiology Department is responsible for developing controls for plant diseases and aspects of pesticide fate and movement in the environment.

Pre-emergence herbicides often are used to enhance warm season grass plantings. Many times, sod on which pre-emergence herbicides has been used has more plant diseases. Experiments demonstrated that apparently pre-emergence herbicides predispose warm season turfgrasses such as centipede and Saint Augustine varieties to *Rhizoctonia* blight (brown patch). The use of triazine herbicides (particularly Atrazine) resulted in more disease than did other pre-emergence herbicides. Further work indicated that the same herbicides coupled with plant parasitic nematodes cause much more damage than either did alone. The probable reason is that both the chemical and the nematodes damage the roots. A recommendation is to use post-emergence herbicides when appropriate for the weed population.

Herbicide residues in containment ponds at two commercial container nurseries were evaluated. Herbicide residues in the containment and irrigation pond generally followed the herbicide application trends with higher levels following months of high herbicide use and low or no detected herbicides following low use months. Water concentrations ranged from 1 to 300 parts per billion (ppb) for oryzalin, oxyfluorfen and pendimethalin. Sediment concentrations ranged from 0.79 to 1.38 parts per million (ppm) for the same herbicides. Herbicides dissipated rapidly in the aquatic environment with no accumulation over time. Movement of herbicides into

the holding ponds was the greatest with the first irrigation event after application. However, oryzalin dissipation in the holding pond water was rapid and decreased from 300 ppb immediately after the first irrigation to 1 ppb by 14 days afterward.

Several important advances were made in controlling peach fruit diseases this year. One investigator found that the fungus *Gilbertella persicaria* is an important postharvest pathogen causing peach decay that often is confused with *Rhizopus* rot. He found that chlorination of water and good sanitation practice in the packing house control *Gilbertella* rot.

Another scientist found that at least two species of the fungus *Colletotrichum* cause peach anthracnose. Since the species differ in sensitivity to fungicides such as benomyl, this finding is important for control of this disease. The cause of the so-called "red-spot" problem on peach fruit has been tentatively identified as being an *Alternaria* species. In field tests, cleared fungicides were found to be satisfactory controls. The red-spot disease has caused serious economic losses for some peach growers.

Poultry Science

Research in the Poultry Science Department has led to a variety of observations and conclusions pertinent to birds and other vertebrates.

Spermiophages are immunoresponsive cells found in semen and the reproductive tract of vertebrates, e.g. birds and humans. Spermiophage appears to be phagocytic and exhibits mitochondrial biogenesis during culture. Restriction enzyme patterns for turkey mitochondrial DNA were identical to those of turkey liver mitochondrial DNA.

Contributions to the specialized microenvironment in which B-cells — antibody producing cells — develop have been made by studying a novel dendritic cell in the chicken. During critical periods of development, these cells acquire specific surface molecules that could interact with immature cells to affect their differentiation into immunocompetent B-cells. T-cells — important in antibody and cell-mediated immunities — depend on the thymus and maturation of T-cells. On the other hand, supplemental vitamin E was immunostimulatory and consistently impaired growth rate in fast growing strains of chickens. Increasing the VE levels to 300 mg. depressed growth and antibody response to cholera vaccination.

Additional nutritional studies were conducted with fat supplementation and phosphorous. A comparison of prilled fat (a saturated fat byproduct) with poultry fat revealed more favorable results with poultry fat. The ability of dietary phosphorous to improve shell strength varied with the source of phosphorous and genotype.

Information has been provided to the poultry industry concerning the proper utilization of manure, litter and carcass disposal.

Energy consumption of birds in an multi-decked cage facility was half that of birds in a conventional brooder house while bird weight and feed conversion were normal.

The Institute of Wildlife and Environmental Toxicology (TIWET)

The Institute of Wildlife and Environmental Toxicology (TIWET) was established at Clemson University in 1989 and has a clearly defined mission statement: "Dedicated to excellence in research, education and public service programs in environmental toxicology; seeking the best scientific data possible as a foundation for resolving ecological conflicts between aquatic and terrestrial wildlife resources and toxic substances released into the environment."

TIWET now has expanded its program into the following research sections: 1) aquatic toxicology; 2) ecological modeling; 3) biochemical and behavioral toxicology.

gy; 4) ecotoxicology; 5) environmental chemistry; 6) quality assurance and management; and 7) research support.

Ecotoxicology studies involving chemicals used in agricultural production in the Midwest are continuing both in aquatic and terrestrial studies. Most of TIWET's Midwestern research operations are conducted through the Edith Angel Environmental Research Center in Chariton, Iowa. These large scale, multi-year studies focus on the effects of pesticide runoff into farm ponds in the Midwest, the use of agricultural insecticides on wildlife, particularly avian species, as well as non-point source pollution runoff in watersheds using a "watershed ecological approach."

A new project generating a large amount of interest is the work at Kiawah Island, S.C., on a golf course ecosystem research program. TIWET is addressing environmentally sensitive techniques for golf course management with support from the Professional Golfers Association, the U.S. Golf Association, and Monsanto.

Another project attracting major public interest is the work in Costa Rica with CORBANA. This cooperative project addresses the effects of runoff of pesticide chemicals on fish and wildlife species associated with banana plantations. This project also attracted CNN news coverage with a special documentary on environmental research in the banana plantations.

Cooperative education and research projects are under way with Russia through the Russian Academy of Sciences. This will involve faculty, staff and students.

A growing area of public concern is hazardous waste sites. In spring 1993, Westinghouse Savannah River Co. awarded TIWET a grant through the S.C. University Research and Education Foundation for a 12-18 month initial study to determine chemical contaminants in the soil and buried drums at a hazardous waste area.

Coastal Research and Education Center

The primary responsibility of the Coastal Research and Education Center is to develop efficient and economical systems for commercial vegetable production in South Carolina. A primary goal is to become a center of excellence in vegetable research.

Solar heating soil under plastic mulch during summer was tested to control belly rot on fall grown pickling cucumber. Pathogen numbers in solar-treated soil were reduced by 96 percent which resulted in a 30 percent decrease in fruit rot on cucumbers.

Seven of 14 tomato breeding lines were found to be significantly more resistant to the disease "bacterial spot" than their resistant parent "Hawaii." Screening of tomato germplasm at the Coastal REC and in growers' fields has resulted in advanced plant germplasm that is scheduled for release to commercial tomato breeders in early 1994.

A granulosis virus of imported cabbageworm continues to show promise as a biological insecticide in laboratory tests and field cage trials.

Apanteles rubecula, a parasite of imported cabbageworm from China, was released for study at the Coastal REC. Subsequent field surveys showed that the parasite had become established. This parasite has the potential to control the imported cabbageworm during early spring when no indigenous parasites are active.

A pilot IPM program for collards was tested in comparison with weekly chemical insecticide applications at the REC and in two grower fields. Better quality collards, higher return per acre and fewer chemical insecticide applications resulted when IPM practices were followed.

Intensive surveys of cowpea revealed that the sucking bug complex, the Southern green stinkbug and the leaf footed bug were major pests. Cowpea curculio and cowpea weevil populations were very low. Spider and fire ants were the most abun-

dant predators. Percent seed damage to cowpea was correlated with increasing numbers of the sucking bug complex.

A refined tomato IPM program was tested in comparison with weekly applications of chemical pesticides. As thresholds were never reached for major insect pests, insecticides were not applied to the IPM-managed tomatoes. There were no differences in number of unblemished fruit and number of fruit with caterpillar or sucking bug damage between the IPM fields and those treated weekly with insecticides.

Asparagus can be forced in summer and fall along the coast to provide another alternative for local growers. The longevity and productivity of forced asparagus, however, lasts for only four years. Researchers continue to increase the longevity of this crop with appropriate cutting pressure and the adaptation of the Taiwan system of mother stalk culture.

Heat tolerant varieties of broccoli have been identified that can withstand high temperatures and humidity and still produce fresh market quality. Long-term production of fresh market broccoli is possible from spring through summer and into fall by shifting varieties best suited to the environment expected. Broccoli is another high value alternative crop well suited to the Low Country.

Sweetgrass, used in the production of African coiled baskets, has been successfully propagated from the wild and planted as a row crop in a large experimental plot at McLeod Plantation on James Island. Cultivated sweetgrass grown inland and from its natural habitat along the beachfront, will help increase the dwindling supply and enable this ancient Low Country folk art to continue.

Edisto Research and Education Center

The Edisto Research and Education Center's mission is to conduct research, extension and teaching programs that focus on agricultural problems unique to the Coastal Plains region. Multi- and interdisciplinary team approaches are utilized to solve existing problems.

The goal at the Edisto REC is to develop, evaluate, and transfer new and improved technology and to incorporate it along with traditional practices into production systems that enhance agricultural production and profit while protecting the environment and natural resources.

Surveys in cotton have shown that 50 percent of S.C. fields have economic infestations of nematodes. Growers need to adequately sample fields and use nematocides and/or tolerant varieties. Research indicated cotton can fully recover from early season square loss from tobacco budworm damage which can save growers one application of insecticide in many cases. Studies also have shown that alternatives are available for control of our major cotton insect pests (budworm-bollworm), although they are more expensive and less efficacious. Scientists will continue to build data that will result in more economical management practices.

Research plots and on-farm demonstrations were used to evaluate reduced pesticide use on peanuts while increasing yields. Results are being utilized to reduce production costs.

Research efforts have continued for interseeding soybeans and cotton into standing wheat. This method is being compared with conventional mono-cropped plots and those planted after wheat harvest.

The initial low input sustainable agricultural project has been continued for a second and third year. Researchers are studying the effects of vetch as a winter cover crop on insects, nematodes and nitrogen requirements following cotton.

Studies were initiated to teach growers how to identify and manage barley yellow dwarf virus on wheat. It is the major economic problem in wheat in the Southeast. It must be managed with minimal pesticide input due to economic and environmental constraints.

The tenth Clemson University Edisto Forage Bull Test was conducted in October 1992. Fifty bulls were sold at an average price of \$2,409 to buyers from the

Carolinas, Georgia and Florida. Seventy-eight percent were sold to commercial cow-calf producers in South Carolina. Fifty bulls have made minimum requirements for the 1993 sale.

A research program was started to evaluate various clovers grown in conjunction with cereal rye on pasture productivity and animal grain. Results may allow farmers to reduce additional nitrogen fertilizer while maintaining high pasture and animal productivity.

An international program has been developed with Indonesia utilizing IPM techniques in soybeans and vegetable crops. A linkage grant has been obtained from USAID between Clemson and a university in Bogor, Indonesia.

Pee Dee Research and Education Center

The Pee Dee Research and Education Center was established in 1911 to meet the needs of producers growing the major crops of the Pee Dee region, which amount to more than 50 percent of the agricultural income in the state.

Use of a nitrification inhibitor with poultry manure applied as a nutrient source to winter wheat increased the amount of nitrogen recovered from the manure by 75 percent. The potential for nitrate contamination of groundwater from nitrogen released from manure is reduced with use of this inhibitor.

Irrigation scheduling methods providing different levels of soil moisture to bermudagrass fairway turf were found to have a limited effect on turf appearance. This work indicates the potential to use irrigation scheduling that allows a soil moisture deficit to occur in an attempt to conserve water.

Conservation tillage systems were utilized to compare insect populations and various weed control measures following crimson clover. This cooperative study with USDA's Agricultural Research Service showed that beneficial arthropods regulated the potentially destructive tobacco budworm through June 1993.

Municipal solid waste compost is being evaluated at different rates as a soil amendment on which four vegetable crops will be produced. Yield and quality of tomatoes, snap beans, leafy greens and carrots will be determined. Rate effects of compost on soil moisture, CEC, and fertilizer efficiency will be measured. The feasibility of repeated high soil loading rates also will be evaluated.

A study to determine the necessity of treating early-season infestations of bollworms and tobacco budworms on cotton indicated that fruit loss during June did not reduce lint yield. Fewer pesticide applications will decrease the cost of cotton production and reduce the amount of pesticides in the environment.

Several species of thrips are serious economic pests of cotton. A two-year study of alternate host plants indicated that wheat and wild mustard serve as reservoirs of thrip populations which later migrate to cotton.

The European corn borer is a major economic pest of many crops including corn, cotton, sorghum and vegetables. Effective control of this pest requires monitoring of the moth flights so that control measures can be timed properly. An improved sex attractant lure was developed which is 10 times as effective as the commercially available lure.

Preliminary studies indicated that the bollworm/tobacco budworm ovicide 'amitraz' enhances the activity of low rates of pyrethroid insecticides. Use of low-rate insecticide mixtures is a desirable resistance management strategy because it reduces selection pressure for resistance to the pyrethroids and conserves beneficial insect species.

The Pee Dee REC was the site for a very successful turf field day. Participants representing all aspects of the turf industry observed on-going research in disease, weed control and pest control, and irrigation and its effect on nitrogen movement in the soil.

Sandhill Research and Education Center

The Sandhill Research and Education Center has assumed an exciting new mission in urban and environmental horticulture. Interdisciplinary programs will involve horticulture, plant physiology, entomology, plant pathology and environmental sciences.

These programs strive to develop information leading to environmentally sound practices for the production and utilization of landscape plants and turfgrasses. Technology developed by the research programs will be transferred to homeowners, nursery growers and user groups by Extension programs using the public gardens as a field laboratory for educational programs. As the new programs are phased in, previous programs are being shifted to other Experiment Station facilities around the state.

A master plan has been completed that will make the Sandhill facility a regional resource and a national leader in urban and environmental horticulture. Implementation of the new programs is progressing with the relocation of peach program faculty to the Clemson campus and realignment of remaining programs at the Sandhill Center. Three faculty members currently are housed at the center. While programs are fiscally supported by the state, more than 25 collaborators also have supported the programs of the Sandhill Center during the past year.

Horticultural research activities include the evaluation of landscape plants and turfgrasses for S.C. growing conditions, plant nutrition, low input plant maintenance, residential turfgrass culture, the biological control of parasitic nematodes attacking turfgrasses, and efficacy of environmentally safe fungicides and nematicides.

Plant evaluations include more than 300 holly cultivars, 64 crabapple cultivars, three centipede turfgrasses, more than 10 advanced bermudagrass cultivars, buffalograss, indiagrass, bluestem grass, switchgrass and panicgrass. Several projects are under way to advance the development of low input landscape maintenance. Numerous species of wildflowers are being evaluated for use in the Highway Department Wildflower Program. Plantings in the Environmental Gardens have been supported through competitive grant funding and local garden club support.

The S.C. Swine Evaluation Center and related swine programs produced leaner, faster growing and more efficient breeding stocks for state swine producers. Swine evaluated in the program in 1992-93 were the leanest average boars since evaluation began at the center in 1974. These improvements are in great demand both by consumers of pork and profit-minded swine producers.

The faculty and staff of the Sandhill Center look forward to continued service to the people of the Midlands and the state through programs in urban and environmental horticulture. New programs will impact the lives of South Carolinians by enhancing the quality of the urban and suburban environment in which they live.

Active Research Projects 1992-93

Agricultural and Applied Economics

Rural economic development: alternatives in the new competitive environment.

Economic and technical forces shaping the Southern dairy industry.

Competition and change in the fruit and vegetable production and marketing system.

Agricultural adjustment in the Southeast through alternative cropping systems.

Changing structure of local labor markets in nonmetropolitan areas.

Quantifying long-run age risks and evaluating farmer responses to risk.

International trade research on commodities important to the Southern region.

Economics of wetland preservation.

Transformation of agriculture: resources, technologies and policies.

Econometrics analysis of employment in agribusiness industries.

Economics of wildlife resources.

Forward pricing mechanisms to manage agricultural risk in South Carolina.

Economic value of ornamental horticulture.

Impacts of agricultural development and policies in selected countries on South Carolina and the Southeastern United States.

Marketing characteristics of the S.C. wholesale greenhouse industry.

Agricultural Education

Diffusion of technology to traditional and nontraditional agricultural education clientele.

Agricultural and Biological Engineering

Control, prediction, economics and environmental effects of soil erosion.

Dynamic modeling of water quality in aquaculture.

Integrated systems and controls for processing and storing agricultural commodities.

Systems for providing and controlling interior environments for poultry and livestock.

Meteorological research and agricultural management modeling for Southern agriculture.

Engineering systems for plant tissue culture.

Ground surface sensing through plant foliage.

Management of animal waste in support of sustainable agriculture and quality water resources.

Improved harvesting, sorting and production practices for channel catfish and crawfish.

Optical measurement and inspection of biological systems.

Physical property modification of edible, degradable films.

Defining thermoneutrality of brooding-age broiler chickens via a thermal environment index.

Impact of agricultural systems on surface and ground water quality.

Improved pesticide application technology for peach orchards.

National atmospheric deposition program.

Environmental capability of textile and other polymeric materials.

Engineering principles for conservation cropping systems.

Agronomy and Soils

Mineralogy and charge properties of readily dispensable fractions from selected soils and sediments.

Weed control and herbicide resistant weeds in corn, cotton and soybean.

Enhancing beneficial microorganisms in the rhizosphere.

Variability of soil properties and its effect on water quality and soil management.

Grain yields and field performance evaluation of barley, oat, rye, triticale and wheat.

Cultivar performance evaluation of corn, cotton, grain sorghum, peanuts and soybeans.

Breeding tall fescue in South Carolina.

Mixed species pasture establishment and persistence.

Genetic and molecular markers for chromosome engineering in soybean.

Soybean breeding.

Ecological relationships in the productivity and persistence of high quality forages.

Plant development responses to relay intercropping.

Genetic improvement of tall fescue-acremonium association.

Behavior, fate and bioactivity of acetolactate synthase (ALS)-inhibiting herbicides.

Animal, Dairy and Veterinary Sciences

Nutrition and management of swine for increased reproductive efficiency.

Development of profitable beef forage production systems for the Southern region.

Genetics of body composition in beef cattle.

Rapid determination of milk shelf life using antibodies to spoilage bacteria.

Selection for improved growth of muscle in swine and the effects on hot processed meat products.

Growth of muscle and deposition of fat in beef as related to genetics and forages.

Influence of seminal estrogens on uterine and ovarian functions in the mare.

Expression and function of oviductal growth factors during early embryogenesis in the pig.

Feasibility of reduction of fat percentage in fresh pork sausage.

Evaluation of beef cattle germ plasm resources involving additive and nonadditive genetic effects.

Improving reproductive efficiency of cattle.

Modifying unsaturated fatty acids in ruminant tissues.

Growth factor involvement in bovine and caprine embryo culture.

Mycotoxin effects on the maturation and function of chicken thymocytes and peripheral T-cells.

Porcine conceptus and associated endometrium gene expression during early development.

Influence of fescue toxins on the cellular and humoral immune system in the rabbit.

Aquaculture, Fisheries and Wildlife

Environmental requirements and transport-related stress in hybrid striped bass and red drum.

Status of the green salamander in South Carolina.

Black bear demography, habitat use and home range in South Carolina.

Abundance and diversity of fishes in relation to stream habitat.

Effects of formulated ration on crawfish production and water quality in ponds.

Biological Sciences

Molecular genetic variation and genome organization in root knot nematodes.

Entomology

Improved systems of control for pecan arthropod pests.

Black fly damage thresholds, biology and control.

South Carolina participation in NAPIAP.

Cloning and analysis of genes for insecticide resistance.

Biology and management of peach arthropods.

Identification and distribution of insects of potential importance in South Carolina.

Development of entomopathogens as control agents for insect pests.

Development and reproductive behavior of selected Tachinidae parasitizing *Helicoverpa* (+ *Heliothis*) zea.

Biology, ecology and management stresses for azalea stem borer and dogwood twig borer.

Cultural management of alfalfa weevil.

Neuropeptide hormonal mechanisms underlying insect migratory behavior.

Spatial relationships among selected crop pests and their parasitoids.

Biocontrol strategies for arthropod pests in animal production systems.

Bionomics and management of selected insect pests of woody landscape plants.

Management of urban arthropods.

Food Science

Development of new processes and technologies for the processing of poultry products.

Mineral binding to components of dietary fiber.

Packaging of food products for maximum quality and extended shelf life.

Combined technologies for enhancement of quality in intact and formed meat products.

Bacterins from lactic acid bacteria to improve food safety.

Characterization of inhibitors produced by food bioprocessing propionibacteria.

New membrane separation opportunities in food processing.

Modified atmosphere packaging on shelf life of shelled green lima beans.

Extended shelf life of shelled, whole eggs in modified atmosphere.

Mineral binding affinity of biopolymers.

Packaging effects on shelf life of meat, egg and fish products.

Mathematical models for modified atmosphere packaging of fresh fruits and vegetables.

Packaging to minimize peach bruising in handling and transportation.

Degradable, compostable, ruminant-edible coated paper for packaging.

Influence of processing and packaging on the quality of poultry products.

Enhancing membrane separations in food processing.

Home Economics Research (cooperative with Winthrop University)

Nutritional status and body composition of healthy, black, normal-weight, middle-age females.

Horticulture

Plant germplasm: its introduction, maintenance and evaluation.

New flowering pot plants through chemical growth regulation and/or environmental manipulation.

Ornamental plant production and impact of slow-release nitrogen fertilizer on surface water.

Evaluation of turfgrass cultivars and herbicides.

Improved melon cultivars.

Tall fescue and bermudagrass cultivars for Eastern transition zone turf.

Ornamental herbicide movement, contamination and modification in runoff and surface water.

Stress physiology and cultural management of peach.

Breeding improved peach, nectarine and rootstock cultivars.

Postproduction carbohydrate metabolism in floriculture crops.

Manitol metabolism in snapdragon, *Antirrhinum majus*.

Storage of rooted and unrooted cuttings of ornamental plants.

Growth, rapid acclimation and shipping of *Cattelya* orchid in single-use sealed membrane vessel.

Pulsed amperometric anion-exchange chromatograph for interdisciplinary research.

Vegetative management of erect blackberries.

Influence of light quality on the storage quality of potato.

Metal accumulation and toxicity disorders in ornamental plants.

Extension of storage life of fruit crops by controlled/modified atmosphere storage.

Plant Pathology and Physiology

Biochemical and residual properties of pesticides.

Physiology and molecular genetics of selected plant-bacterial interactions.

Virus and virus-like diseases of woody, deciduous fruit crops.

Forage legume viruses: identification and genetic resistance for improved productivity.

Control of nematodes on peach and diseases of peach and apple trees.

Gene expression during infection of plants by *Magnaporthe grisea* and *aspergillus* species.

Control of peach tree short life in South Carolina.

Resistant, non-host and overwintering crops for the management of nematodes of soybean.

Viruses and viral diseases of peach.

Managing plant parasitic nematodes in sustainable agriculture with emphasis on crop resistance.

Plant growth regulators: resistance, metabolism and developmental responses.

Poultry Science

Functional enhancement of immune system during embryonic development.

Genetic relationships to growth and reproduction in diverse poultry populations.

Effects of cooling avian embryos: immunocompetence and stress.

Glutathione (GSH) and GSH S-transferases in the regulation of lipid modulators of cell function.

Function and significance of turkey seminal spermiphages.

Coastal Research and Education Center

Urban horticulture for coastal South Carolina. (Entomology)

Management of insect pests of vegetables. (Entomology)

Storage potential of S.C. melons using modified atmosphere packaging. (Horticulture)

Improving the export potential of S.C. watermelons using modified atmosphere packaging. (Horticulture)

Improvement of stand establishment and yield of alternative vegetable crops for South Carolina. (Horticulture)

Applied ecology of pathogens as a basis for integrated management of vegetable diseases.

Management of rhizosphere dynamics to control soilborne pathogens and promote plant productivity.

Edisto Research and Education Center

Arthropod induced stress on soybean: evaluation and management. (Entomology)

Insect management in reduced-cost cotton production systems. (Entomology)

A new reduced tillage, wheat-soybean intercropping system for South Carolina. (Agricultural and Biological Engineering)

Summer crop root development and nitrogen dynamics as affected by previous winter crop and tillage.

Grazing management and supplementation effects on grass/legume pasture production and animal gain.

Pee Dee Research and Education Center

Cotton breeding for improved quality, insect resistance and production efficiency. (Entomology)

Breeding disease and Meloidogyne arenaria-resistant flue-cured tobacco. (Agronomy and Soils)

Cultural practices and variety testing for flue-cured tobacco. (Agronomy and Soils)

Tobacco disease and nematode control. (Plant Pathology and Physiology)

Influence of mulches on nematodes and diseases in tomato and corn. (Plant Pathology and Physiology)

Biological control of selected arthropod pests and weeds through introduction of natural enemies. (Entomology)

Management strategies for arthropod pests of cotton. (Entomology)

Economic management of tobacco insect pests. (Entomology)

Environmental stress and production practice effects on the growth and physiology of agronomic crops. (Agronomy and Soils)

Soil and plant nitrogen tests for predicting nitrogen fertilization of wheat. (Agronomy and Soils)

Integrated crop management effects on stalk-boring Lepidoptera. (Entomology)

Potential impact of endemic and imported natural enemies on cotton insect pests. (Entomology)

Multipurpose bulk processing systems for diversified tobacco farms.

Sandhill Research and Education Center

Technical and economical efficiencies of producing and marketing landscape plants. (Horticulture)

Rootstock and interstem effects on pome and stone fruit trees. (Horticulture)

Microirrigation of horticultural crops in humid regions. (Horticulture)

Rootstock and interstem development for peach cultural systems. (Horticulture)

Technical Contributions

- 3316 BIOREACTOR DEVELOPMENT FOR CONTINUAL-FLOW, LIQUID PLANT TISSUE CULTURE by S.A. Hale, R.E. Young, J.W. Adleberg, R.J. Keese and N.D. Camper (Agricultural and Biological Engineering, Horticulture, and Plant Pathology and Physiology 7-03-92).
- 3317 RESEARCH NOTE: EFFECTS OF PERFLUORO-CHEMICAL DILUENT ADDITIVES ON FERTILIZING CAPACITY OF TURKEY SEMEN by R.J. Thurston, M.S. Rugoff, T.R. Scott and N. Korn (Poultry Science 7-08-92).
- 3318 FLIGHT DISTANCE AND ATTRACTANCE OF TRICHOPTERA TO ULTRAVIOLET LIGHT TRAPS by J.C. Morse and J.D. Culin (Entomology 7-08-92).
- 3319 IN VITRO REGENERATION OF *SANTHIUM STRUMARIUM* L. (COLCKEBUR) FROM SHOOT TIPS by J.P. Ellis and N.D. Camper (Plant Pathology and Physiology 7-08-92).
- 3320 REED CANARYGRASS SURVIVAL UNDER CYCLIC INUNDATION by J.S. Rice and B.W. Pinkerton (Agronomy and Soils 7-10-92).
- 3321 EXTENSION OF THE CRAYFISH SEASON BY DELAYING HARVESTS AND SUPPLEMENTAL FEEDING by M.W. Whaley and A.G. Eversole (Aquaculture, Fisheries and Wildlife 7-17-92).
- 3322 END OF DAY FAR-RED LIGHT REDUCES THE HEIGHT REDUCTION OF *CHRYSANTHEMUM* INDUCED BY CUSO₄ SPECTRAL FILTERS by N. Rajapakse, M. McMahon and J. Kelly (Horticulture 7-27-92).
- 3323 LACTACIN B, A BACTERIOCIN PRODUCED BY *LACTOBACILLUS ACIDOPHILUS* by S.F. Barefoot, C.G. Nettles and Y.R. Chen (Food Science 8-06-92).
- 3324 RELATIVE HUMIDITY AND TEMPERATURE EFFECTS ON TENSILE STRENGTH OF EDIBLE FILM PROTEIN AND CELLULOSE ETHER FILMS by A. Gennadios, H.J. Park and C.L. Weller (Agricultural and Biological Engineering 8-06-92).
- 3325 COMPOSTING BROILER LITTER FROM TWO MANAGEMENT SYSTEMS by S.T. Henry and R.K. White (Agricultural and Biological Engineering 8-06-92).
- 3326 CULTURED SPERMIOPHASGES FROM SEMEN OF DOMESTIC TURKEY (*MELEAGRIS GALLOPACE*) GENERATE LARGE NUMBERS OF MITOCHONDRIA by B.S. Perez, F.C. Derrick, N. Korn and R.J. Thurston (Poultry Science 8-06-92).
- 3327 HABITAT RELATIONSHIPS OF TWO CRAYFISH SPECIES IN A MOUNTAIN STREAM by A.G. Eversole and J.W. Foltz (Aquaculture, Fisheries and Wildlife 8-17-92).
- 3328 DESIGN OF A CONCRETE SEISMIC MASS FOR A PACKAGING VIBRATION TESTING SYSTEM by P.J. Vergano and R.F. Testin (Food Science 8-17-92).

- 3329 EVALUATION OF A CERAMIC ROOF COATING by W.H. Allen, J.D. Harmon, D.E. Linville and M.V. Bramlett (Agricultural and Biological Engineering 8-17-92).
- 3330 EPISODIC WHOLE PLANT GROWTH PATTERNS IN LIGUSTRUM by J.S. Kuheny and M.C. Halbrooks (Horticulture 8-31-92).
- 3331 TALL FESCUE TOXINS AND TOXIN INTERACTION ON IN VITRO RAT PITUITARY CELL PROLACTIN SECRETION by J.R. Strickland and D.L. Cross (Animal, Dairy and Veterinary Sciences 9-01-92).
- 3332 TOXICITY OF AMMONIA AND NITRATE TO SUNSHINE BASS IN SELECTED ENVIRONMENTS by C.R. Weirich, J.R. Tomasso and T.I.J. Smith (Aquaculture, Fisheries and Wildlife 9-01-92).
- 3333 BURSAL SECRETORY DENDRITIC CELL A MICROENVIRONMENT ISSUE by B. Glick and I. Olah (Poultry Science 9-02-92).
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- 3489 ORGANIZATIONAL STRUCTURES OF AGRICULTURAL EXPERIMENT STATIONS (AES) AND COOPERATIVE EXTENSION SERVICES by R.E. Young and C.H. St. John (Agricultural and Biological Engineering, and Management 4-14-93).

COOPERATIVE EXTENSION SERVICE

For 79 years the Cooperative Extension Service, the educational outreach arm of the Clemson University Division of Agriculture and Natural Resources, has provided information and statewide continuing education programs that can make life easier and more enjoyable for every South Carolinian.

The programs cover 16 disciplines relating to agriculture and natural resources and to family, youth and community development. In addition to general education information, special programs are included for limited-resource farmers and the economically disadvantaged.

Funded by federal, state and county governments, the Extension Service was created in 1914 as a nationwide system designed to carry education from land-grant universities to the people. Extension has worked closely with South Carolinians, them build better lives through dissemination of practical, useful information within its assigned areas of responsibility.

Originally conceived to help rural residents, Extension has responded to the changing needs of those it serves by broadening its scope of activities to include urban and suburban problems.

Clemson, through its Extension Service, maintains an office manned by agents in each county. A professional staff of Extension subject-matter specialists at the University and four Research and Education Centers around the state, compiles information from research and translates it into information the people of South Carolina can use day to day.

From basic nutrition information to irrigation field tours, Extension staff members and volunteers are teachers carrying University educational programs to all areas of the state.

The Extension program is organized around these broad categories: agriculture and natural resources (including special programs for limited-resource farmers), family and youth development (including 4-H and the Expanded Food and Nutrition Education Program), community development and 1890 programs conducted by S.C. State University, in cooperation with the Clemson Extension Service.

As a part of its four-year planning cycle, the Clemson Extension Service has developed a new plan for programs through the mid-1990s. Nearly 1,000 South Carolinians helped Extension identify major problems facing the state and prepare a new plan to address those problems. In addition, Extension's four-year plan outlines educational activity for base and mandated programs related to its mission.

Drawn up in 1990 and 1991, the plan was developed in concert with the S.C. State University Extension program. It now is guiding the development and implementation of Clemson Extension educational programs in such areas as water and food quality, management of other natural resources and family and youth development.

The Clemson Extension plan of work, which meshes well with the University's strategic plan on the environment, identifies and addresses issues of concern to a broad spectrum of the state's population.

In putting the plan together, Extension's state staff studied the latest demographic information on the area. Situational statements were compiled by Extension faculty members on campus and in Clemson Extension offices in each county.

These statements were reviewed by priority identification committees in every county. These committees were made up of a cross section of local county residents. Statewide, more than 750 people served on these committees.

They met, identified local educational needs and prioritized them. Those needs related to Extension's mission were consolidated at the state level. The list was studied by members of the State Extension Advisory Council and a team of 22 Extension professionals. They recommended nearly 100 items to include in the plan of work.

From among the issues identified, priority is being given to six statewide issues:

- Natural resources management;
- Food quality, safety and nutrition;
- Profitability and sustainability of agriculture;
- Waste management by industry (including agriculture), municipalities and consumers;
- Water quality; and
- Youth at risk.

Five of these six statewide thrusts have the environment at the center of their focus. The plan includes 33 educational program thrusts for agriculture and natural resources, 36 for family and youth development and four for community development. Reports from these thrusts follow.

Natural Resources Management

The stewardship of all state lands is of great concern to South Carolinians. The 1990 Farm Bill added to Extension's mandate to facilitate the stewardship of natural resources.

Extension conducted programs on best management practices to improve the quality of natural resources. More than 750 landowners used best management practices on their forest land.

Damage by deer is a major problem for row crop farmers in much of the state. A joint program with S.C. Wildlife and Marine Resources Department and Clemson Extension is under way to determine management alternatives that will reduce deer damage. A pilot area was established in Hampton County to implement deer population control alternatives and to assess how the changes impact crop damage. Agents, specialists and graduate students are working with landowners to collect data.

Teaching KATE (Teaching Kids About the Environment) is a three-day hands-on learning program for S.C. middle-school students. From a pilot program with 551 children in spring 1992, KATE has been presented to 3,400 youth. Through KATE, we're building a concern for the use and management of our natural resources. The program is to be expanded.

County programs were conducted for professional foresters and other resource professionals on the use of best management practices on wetlands, forests and wildlife areas. As a result of Extension efforts, 10 counties reported 10,950 acres of land managed using best management practices.

Profitable and Sustainable Agriculture

The concept that agriculture be profitable is readily accepted. But the concept of a sustainable agriculture is nebulous. Differences of opinion and perceptions exist because criteria do not exist for measuring sustainability.

The term has been used extensively to promote political agendas. Social concerns about pesticide and other agricultural chemical residues in food and water continue to mount. Differences of opinion still exist within the general population, the agricultural industry, scientists and special interest groups regarding technical

and sociological issues. The most difficult obstacle to overcome still is individual perceptions of specific risks.

Clemson co-sponsored the seventh annual Carolina Sustainable Agriculture Conference at Winthrop University. Approximately 150 people attended. Also, South Carolina was represented by a team at a sustainable agriculture workshop in March in Georgia. Topics included constraints to sustainable agriculture and how to improve sustainable agriculture education and research in the Southeast.

As a result of that meeting, about 50 South Carolinians met at the Farm Bureau in April to discuss sustainable agriculture.

Clemson University publishes a quarterly newsletter entitled *Sustainable agriculture — information and perspectives on sustainable, competitive agriculture in South Carolina* that highlights state and national sustainable agriculture events.

The Edisto Research and Education Center held a Small Farm Field Day last September, which was attended by 450 people. While the focus of this day was on the small farmer, it provided an opportunity to promote sustainable agriculture. At traditional field days for commodities such as cotton, small grains or soybeans, sustainable agriculture concepts are discussed.

Newsletters produced by specialists in pest management, nutrient management and soil conservation emphasize sustainable agriculture. Nineteen Clemson Extension agents were selected for intensive training on sustainable agriculture.

Waste Management

Thirty-two counties reported 10 or more staff days devoted to waste management education work this year. Fourteen counties and two departments reported accomplishment data. Following is a listing of the objectives achieved in the past year:

Extension continues to contribute significantly to efforts to address solid waste issues and problems in South Carolina. Because of budget problems, other sources of funding have been sought to supplement Extension resources for program work. These include funds provided through the Solid Waste Division of the S.C. Department of Health and Environmental Control (DHEC), grants for recycling projects through the governor's office; funding for publications on composting through the Garden Club of South Carolina, and special project funding by local governments in counties where Extension is helping solve local solid waste problems. Accomplishments in the past year include:

Statewide Integrated Solid Waste In-Service Training: This training was held in September 1992 in Columbia. Thirty-eight agents and specialists participated.

Master Waste Educator: Dorchester, Richland and Lexington counties piloted the program. Twenty-four volunteers received a minimum of 30 hours of training. Volunteers in the pilot counties are developing publications on waste management topics, conducting media campaigns, providing speakers and developing and manning environmental exhibits. We plan to expand the Master Waste Educator program to additional counties.

Solid Waste In-school Curriculum: Extension Solid Waste Program team members in cooperation with the Solid Waste Division of DHEC and Keep America Beautiful, are developing an in-school solid waste curriculum for grades K through 12.

Recycling for the Hotel Industry: Solid Waste Program team members have initiated a pilot project for recycling in the hotel industry. The project is being financially supported by DHEC. The objective of the project is to address recycling and source reduction to meet the needs of the tourism industry. Hilton Head was chosen for the first project because of its concentration of hotels, tourism and recreation facilities. The project will be expanded.

Solid Waste Educational Courses: A course was conducted for landfill managers. The same course, slightly abbreviated, was conducted as part of the certification process for landfill supervisors in March and April. Approximately 70 persons received the training.

Educational Materials: A variety of educational materials has been produced by Solid Waste Program team members to support county extension programs and needs of the general public.

County Extension Solid Waste Programs: County Extension offices continue to be involved in a variety of waste management programs. These programs involve youth and adults, elected and appointed officials, lay community leaders, agricultural producers, and businesses. Cooperating agencies and organizations include DHEC, the governor's office, Keep America Beautiful, the S.C. Recycling Association, and other governmental support organizations such as the S.C. Association of Counties, the S.C. Municipal Association, the 10 regional councils of governments, and chambers of commerce. The Palmetto Leadership Program continues to be a vehicle in some counties for involving volunteers in waste management issues. County Extension agents continue to serve as members and chairpersons of various waste management related organizations.

Significant solid waste-related accomplishments in counties include:

- Lexington and Richland counties jointly trained 16 volunteers in the Master Waste Educator pilot program.
- In Kershaw County, about 250 young people took part in an environmental/solid waste program February through May. They studied landfill recycling, reuse, solid waste surveying and enviro-shopping.
- Dorchester County held an environmental education workshop for teachers and community leaders. Two days were devoted to waste management.
- Anderson County Extension office led programs on enviro-shopping and recycling for 179 adults and 350 youth.

Water Quality: Extension programs focus on enhancing and protecting state waters. Programs stress the prevention of water degradation from plant nutrients, pesticides and animal wastes. Extension has identified 35 agents to work with agricultural producers to help them determine the appropriate rates of nitrogen and pesticides needed to produce field corn. Ten agents work with farmers in the Piedmont to determine the rates of poultry manure being applied to cropland.

Water quality work includes:

Nutrient management: Corn has been identified as the crop associated with greatest agricultural nitrate threat to water quality in the state. Thirty-five agents working in 25 counties have been assigned to work with farmers to establish baseline data on nitrate use on corn.

Pesticide management: Corn has been identified as the crop, and atrazine has been identified as the chemical posing the greatest threat to water quality in 25 targeted counties. As part of the corn water quality project, agents are determining the actual rate of atrazine being applied to corn and will track the application rates throughout several years.

Animal waste management: Poultry has been identified as the animal unit posing the greatest threat to water quality in 10 targeted counties. A statewide in-service training program was held to train agents about practices resulting in holding animal waste residue to an acceptable level. Ten agents are working to document application rates of manure being applied to field crops and animal units in the targeted counties.

South Carolina has two USDA-Extension Service Hydrologic Unit Areas (HUA) that are implementing special educational programs to reduce nonpoint source pollution. The Lake Murray HUA has highlighted the use of a new inter-seeder to reduce nutrient and pesticide runoff from fields. Extension, working with the Soil Conservation Service, is documenting the effects of interseeding crops on erodible lands through demonstration plots. The Lake Bowen HUA is conducting an extensive integrated crop management program on peaches to document the effects of reducing application rates of nutrients and pesticides on fruit production.

Extension has delivered educational programs to foster awareness of the need to promote positive actions to ensure the sustainability of coastal natural resources. The city of Hilton Head purchased an office complex site to be renovated as the new city hall and, working with Extension agents and specialists for technical information and support, will develop the site as a demonstration site on the use of xeriscaping to promote water conservation practices by homeowners and turf professionals.

In the commercial animal agriculture areas, the aquaculture program made major advances in the past year although the industry itself has been undergoing major changes in production and has been through a difficult year in processing and marketing. The 4-H Catfish Cage Project reached 20 counties, and 73 cages were put in production by 4-H'ers. The low-income Catfish Cage Project in association with S.C. State University assisted 31 low-income farmers. A fingerling workshop was held at the Estill Clemson Catfish Demonstration Facility. Aquaculture for low-income farmers workshops were held with more than 60 people participating.

Through the cooperative program with the S.C. Wildlife Marine Resources department, 14 shrimp farmers produced about one million pounds of shrimp last fall valued at \$3 million.

During the year Extension agents reported 2,419 cattlemen attended meetings pertaining to beef reproduction. A total of 209 cattle producers visited county offices requesting specific information on beef cattle expected progeny difference and how to use these measurable traits. Extension agents also reported that 2,693 producers requested general types of information about beef management, nutrition, forages and records.

S.C. milk production and dairy receipts for 1992 were 395 million pounds of milk with farm milk receipts of \$49 million. The dairy herds in South Carolina totaled 32,000 milk cows on 190 farms. Because of unrest in the milk market, several meetings were held to discuss pricing. Clemson Extension personnel presented information to producer groups, industry and political groups. Extension dairy programs were conducted on production and financial records. Special programs were presented to dairy producers on ways to better utilize dairy herd improvement production records. Dairy farmers in the state continue to make great strides in this important record keeping program. Beginning in July 1993 the maximum allowable somatic cell count has been reduced from 1,000,000 to 750,000/ml of milk. Repeat violators will have their permits suspended. Clemson Extension dairy personnel, taking the lead educational role in the national Milk Quality Assurance Program, conducted four meetings.

S.C.'s horse industry continues to grow in numbers as well as sophistication. Horses consume more than 10,000 bales of high quality hay annually in South Carolina, so quality hay has become an excellent cash crop throughout the state.

One of the more successful education events is the horsemen's celebration held at the Garrison Livestock Arena in October. More than 2,000 participated in the

seminars and demonstrations. Most of the breed groups participated in the demonstrations along with many commercial exhibits.

Working to improve housing and ventilation for commercial poultry producers continues to be an emphasis area. With a grant from the governor's energy office, a computer-based environmental control system has been installed in three commercial broiler houses. We currently are monitoring inside and outside conditions in the houses and will use the information to develop control strategies for ventilation, heating and fogging systems. To increase the knowledge of producers on proper management, several presentations were made to poultry producers on improving ventilation in commercial facilities.

With increased concern over the impact of agriculture on the environment, the poultry science program is working with producers to improve waste management practices at their poultry facilities. A demonstration project to show current practices for poultry waste management was developed in Chesterfield County.

General information on poultry health and nutrition still is in demand by producers. Numerous presentations were made on feed quality and poultry health to local producers and at national meetings. Additionally, information on the same subjects was published in popular press and professional publications. Three field trials on improving nutrition for commercial layer flocks were completed in a cooperative effort with S.C. producers.

The smaller producers also are addressed by our program. Publications on feed quality were developed to assist commercial game bird producers in providing quality feed to their birds. Diets for commercial quail producers also were developed and distributed to S.C. producers.

S.C. youth with an interest in birds or poultry are provided the opportunity to participate in our 4-H Poultry Program. Competitive events including poultry judging, poultry barbecue and eggonomics at the state level challenge the participants abilities in knowledge of poultry, oral presentation skills, decision making and leadership. A new "Avian Bowl" contest was introduced. This is a quiz bowl on avian topics.

Swine production in South Carolina has undergone dramatic changes in the last five years. Production has held fairly steady while the number of farms has dramatically decreased. A lack of carcass quality, resulting in depressed market prices, has been the primary reason for most small herds to cease production. Herds producing high quality carcasses have seen an increase in marketing potential.

Greenwood Packing Co. has increased daily kill by approximately 1,000 head a day. They continuously are pressuring their buying stations and major producers to produce animals with less backfat. Other major purchasers of S.C. top hogs include Hatfield of Pennsylvania, Smithfield and Gwaltney Packing Companies of Virginia and Smithfield Foods and Lundy Packing Companies of North Carolina. All of these out-of-state companies have pricing systems based on carcass yield or percent lean.

Data from the S.C. State Performance Tested Barrow show indicate continued progress in decreasing backfat and increasing loin eye size.

South Carolina has begun to see the creation of swine contracting companies, similar to those massive systems in North Carolina. These firms are dedicated to both volume and quality. They offer participating producers management assistance and quality nutrition, as well as superior genetics. Contracting systems are based in Horry, Williamsburg, Clarendon and Orangeburg counties. It would seem they eventually will develop a large share of S.C.'s production. A high degree of cooperation exists between these contractors and the Extension Service.

Clemson Extension Service plans are very popular among swine producers. The low energy housing systems for farrowing and nursery facilities have been used in more than 80 percent of all swine buildings constructed in the last three years.

In the agronomic crop area, many cotton farmers have trouble maintaining acceptable levels of profit from year to year. High input costs, weather variations and

poor management practices contribute to wide swings in cotton yield, quality and profit. Higher cotton profits can be achieved by educating growers on management, processing and marketing practices.

Cotton acreage harvested in South Carolina decreased from 210,000 in 1991 to 193,000 in 1992. Lint yield in 1992 was 565 pounds per acre with a total state production of 226,000 bales and a value of more than \$61 million. Cotton producers improved marketing skills in 1992, specifically in forward pricing to manage price risk and in wise use of the marketing loan in completing pricing during harvest time. Producers forward priced 28 percent of their crop during the optimum period of May-June. This was the highest of any state and compares with only 5 percent for the nation overall. This skillful marketing added at least \$1.8 million to farm income.

South Carolina has approximately 1,100 cotton producers. More than 950 contacts were made through county, regional, state production and marketing meetings and tours.

Forages may be our most under-utilized crop resource in South Carolina. Interest in forages is increasing because many crop acres now are in the Conservation Reserve because of interest in sustainability and because the search for improved profitability leads to the development of farming systems, which often call for integrated crop-livestock activities.

Extension's new hay quality training package, developed for agents in the counties, received considerable use. State specialists continued to write news articles for the S.C. Land Resources Conservation Commission newsletter and the S.C. Department of Agriculture Market Bulletin, helping to build relationships between Extension and sister agencies in the state.

The Agricultural Services Laboratory in 1992 processed 411 hay quality samples and 817 silage samples. The S.C. Department of Agriculture mobile testing laboratory made monthly circuits to Extension offices in 21 counties, testing 463 hay samples, a 12 percent increase when compared with the previous year. Agents and specialists participated in a statewide forage field day in Richland County, with more than 200 attending.

A forage field day, held in Laurens County this year, featured various aspects of grazing management, including management-quality relationships, forage types and equipment and supply demonstrations. Forage field days were conducted at 13 locations during the year. Two new forage leaflets were published, and three pasture weed demonstrations were conducted, with results discussed at field days.

Specialists in Extension Dairy Science and Agronomy largely were responsible for obtaining a \$118,000 Low Input Sustainable Agriculture grant to study the effects of increasing the pasture component of dairy rations on S.C. dairy farms.

The first of a series of county short courses on grazing management was held in Oconee County this past spring. Additional short courses will be in Fairfield and Abbeville counties. A total of 530 clients participated in two Extension and one industry field days, 12 on-farm demonstrations, and a statewide small grain meeting.

Precision management practices were stressed at nine production meetings, three field tours, two TV productions, six newsletters and at 14 on-farm demonstrations in 10 counties. In addition, a field survey of production practices in the top 10 wheat counties was conducted to better understand what practices are limiting profitability. A wheat yield and efficiency contest had 17 entries from eight counties.

A multifaceted program to reduce maleic hydrazide residue has been used. Much of the educational effort is focused on using improved sucker control programs that insure season-long sucker control with reasonable MH levels. These efforts include on-farm tests, a special grower sampling program in two counties and involvement in a regional growth regulator research project. MH residues have decreased from 214 ppm in 1990 to 143 ppm in 1992, based on stabilization samples. Reducing MH residues in cured tobacco will help insure a continued strong export market, as the Europeans (our major customer) prefer tobacco with low MH residues.

Efforts to reduce unripe and immature tobacco being offered for sale also have proven productive. Major efforts, including on-farm tests, to reduce nitrogen fertilizer usage to recommended levels have resulted in improved quality of cured leaf.

In the commercial horticultural crop area, 17 meetings at county, regional and national levels were conducted to advise growers of new technology and industry problems. These included meetings focused on apples, peaches (including a meeting on processing peach production), three special meetings on the new worker protection standard, airblast sprayer calibration, and pesticide safety issues, and several meetings on small fruit production, disease and insect management in small fruits and disease and insect management in strawberries.

Weather stations to provide data input for computer decision aides now are in operation. A change in grower attitudes toward using electronic technology in day-to-day decisions is occurring.

The concept of a subscription fruit newsletter for growers and industry stakeholders was tested. Integrated pest management recommendations as spray guides were published after having missed a year due to budget reasons. Specific pest management strategies were updated in the *Agricultural Chemicals Handbook*.

Drought starting last spring has contributed to heavy irrigation demand and reduced fruit size and price. Summer fruits without irrigation have been severely impacted.

For turfgrass, current insect, disease and weed management recommendations are made annually. All turfgrass insect, disease and weed control recommendations are reviewed and updated annually in the *Agricultural Chemicals Handbook* which is the primary publication for turfgrass insect management. The impact of this information is that turfgrass commercial producers, managers and home lawn owners are provided with recommendations that are appropriate and legal for the pest complex attacking turfgrass in South Carolina.

Intensive in-service training on identification and sampling methods, including hands-on field demonstration, was provided to 12 agents. Recycling grass clippings was a special new feature in this educational program.

An objective is to influence at least 20 percent of turfgrass growers contacted by the agents to change production practices which help protect the environment.

A survey of pesticide use on golf courses in South Carolina currently is being conducted. This should answer many of the environmental questions concerning chemicals and the environment.

In vegetable crops, production still is in a state of transition in South Carolina. Large scale production is decreasing, but limited-scale operations are increasing in number and size. As the state becomes more urbanized, opportunities for limited-resource growers to produce and market vegetables increase.

Many of these new growers begin operation with very limited skills. To successfully compete in this highly competitive market, these growers must rapidly improve production skills. Older established growers must change their practices as the loss of registered pesticides and environmental concerns mandate a change to a more sustainable type of production. In most cases this requires an increase in management skills.

Extension programming is attempting to improve management skills through use of the integrated pest management concept and more efficient use of fertilizers and natural resources.

In recent years Extension programming has been successful in assisting growers in adopting these techniques. All large-scale tomato growers now are using these techniques. The adoption of these techniques by growers has occurred primarily because of Extension programming efforts. Smaller growers have been slow to adopt these techniques, but because of Extension demonstrations and guidance from agents, this is changing rapidly.

The inefficient use of energy results in higher costs for all citizens. Many producers are making do with old inefficient equipment and facilities which increase their cost of production. Thirty county agents and tobacco producers were instruct-

ed on the management of greenhouses for producing tobacco transplants. The use of solar heating was demonstrated to 500 4-H'ers at camps. Eighteen farm power equipment owners were instructed on proper maintenance procedures.

Nearly 500 persons saw demonstrations of vegetable cooling at the S.C. Small Farm Field Day at the Edisto REC. A demonstration of vegetable cooling was held at the Coastal Agricultural Expo in Florence. On-farm demonstrations of vegetable cooling equipment were conducted on four farms. Training on fruit and vegetable cooling was held for 15 participants.

A total of 1,422 plans were distributed. Of these, 50 percent were swine housing, 8 percent human housing and 3 percent were fruit/vegetable plans. Requests from outside the state made up 8 percent of the total. Air handling in greenhouses was demonstrated for tobacco farmers and Extension agents.

Extension programs in Agricultural and Applied Economics at Clemson focus on four key areas: increasing profits from farm products in South Carolina, making S.C. agriculture more competitive relative to other U.S. regions and in international markets, predicting effects of U.S. government fiscal, monetary and farm policy programs on S.C. agriculture and rural areas, and making energy-efficient and environmentally safe use of natural resources such as wetlands.

Small-scale farmers and families more effectively employ available resources by identifying and using alternative opportunities. More than 1,500 farmers participated in specific small-scale farm educational programs. More than 500 small-scale producers participated in tours and demonstrations of production and management practices on farms and in area tours. Revised or new publications were used by more than 3,200 small-scale farmers. A Small Farm Field Day held at Edisto Research and Education Center attracted about 500 people.

Outlook information was provided to 250 peach, apple and vegetable producers on prices, expected production and profitability. More than 10,000 budgets have been distributed to lenders and farmers. Five two-day tax workshops for income tax preparers were organized and conducted. There were 773 tax professionals enrolled in the courses who prepared 10,468 farmer tax returns and 213,331 other returns in 1992. Participants received updated information on changes in the 1992 tax laws.

The 10th annual Southeastern Agricultural Lenders School drew 35 agricultural lenders from four states.

Nearly 500 participated in educational programs relating to farm safety or farm injury prevention. In addition, farm safety lectures were conducted for 20 Clemson University agricultural mechanization students and 16 Bob Jones University agriculture students. A session on farm safety was included in the annual training meeting for 42 Clemson farm managers.

A seminar on agricultural injury prevention was conducted for faculty and residents of the University of South Carolina School of Medicine. A presentation on farm injury prevention was made to the 25 attendees of the Southern Agro-medicine Consortium meeting. Sixty-five Extension personnel and guests attended the one-day AgrAbility training session developed with the S.C. Disabilities Research Commission.

A fact sheet on chain saw safety was developed in response to Hurricane Andrew and is included in a national almanac electronic data base. Two farm accident rescue training sessions were conducted, providing training to 65 EMTs, paramedics, firefighters and other rescue personnel.

Extension's food science program focused on activities to enhance competitiveness through adherence to good manufacturing practices, adoption of total quality management procedures, and optimization of processing efficiencies. Accomplishments for the year included delivery of 12 multiday training short courses or workshops and 28 lectures attended by more than 2,000 employees and managers of about 225 in-state and 200 national companies on methodologies of statistical process control, total quality management, ISO 9000 and good manufacturing practices.

Food scientists also conducted more than 65 on-site advisories for 25 S.C. firms to promote the adoption of improved food processing practices, develop new products and/or packaging technologies. The adoption of advisories by several state firms led to the market introduction of two barbecue sauces, a line of cookies, chili and several salsa products.

Food science faculty also prepared and delivered 25 problem-solving analysis reports used by clients to correct specific product, processing and/or packaging problems to improve processing efficiencies and shelf life quality. Additionally, they provided 817 informal educational advisory (other than on-site) responses for information requested from food processors/extension offices/agencies/citizens on aspects of food safety, quality, preservation, packaging, labeling or processing.

Food scientists prepared and published three Extension bulletins plus four technical journal articles as references to promote the adoption of quality management methodologies, compliance with new food labeling regulations, and to enhance international trade competitiveness. In addition, a 150-page technical short course manual covering 16 areas of examination for certification in the sterilization of acidified and low-acid foods was translated into Spanish for the training of Hispanic speaking employees working in the commercial canning industry.

In the area of home grounds and gardens, programs were developed to educate professionals and non-professionals in the establishment and maintenance of landscapes, fruit/vegetable gardens and lawns. Some programs included classroom presentations, workshops, hands-on demonstrations such as fruit and ornamental shrub/tree pruning, newsletters, newspaper articles, tours, news media releases and publications.

Programs also were developed to help Extension Master Gardeners deliver information. Besides responding to telephone calls and office visits, Master Gardeners conducted classroom presentations and hands-on demonstrations/garden clinics, prepared newspaper articles, radio and television programs, and held various workshops at local home and garden centers.

All commercial cotton producers participate in an Integrated Pest Management (IPM) program that is coupled with the boll weevil eradication project. Cotton growers have reduced the annual number of insecticide applications from 15 to five since 1983. This represents a reduction of at least 140,000 pounds of insecticides per year.

IPM practices adopted by peach producers include: extended preharvest interval and elimination of certain pesticides on peaches for baby food; reduction or elimination of blossom sprays based on weather condition; extended interval for cover sprays for scab control.

All commercial tomato producers in the coastal region of the state participated in a grower-funded IPM program this year. Tomato growers have reduced pesticide use by an estimated 30 percent since 1982.

The S.C. Pesticide Impact Assessment Program responds to requests from the National Agricultural Pesticide Impact Assessment Program related to EPA regulatory actions on pesticides and carries out pesticide-use surveys for important commodities in the state.

This year the Pesticide Information Program began a survey on pesticide use on fresh market strawberries and continued studies on peanuts, watermelons, peaches, greens, Christmas trees, sweet potatoes, turf, wheat and apples. These surveys are designed to collect pesticide use/benefit information on pesticide use to be used for the benefits side of risk/benefit analyses on pesticides under special review by the EPA or other similar regulatory action.

After completion of some of the surveys, the pesticide use survey manager left for another position, and there are no plans to replace this person because of insufficient funding.

During the past year the Agricultural Service Laboratory analyzed 28,588 soil samples, 3,858 plant samples, 263 irrigation water samples and 82 manure and waste samples.

The new equipment purchased for the laboratory is doing very well. As a result of the improved instrumentation and increased efficiency, the lab has not needed to fill two lab technician positions, which since have become vacant. The soil sample load was about the same as the previous year due to exceptionally wet weather during January and February. This is when most farmers sample their fields for spring planting.

Currently, the lab is addressing programming needs to overhaul its archaic system and limited capabilities. A committee has been formed to assess the need for new hardware, software and programming to make the lab more useful and efficient.

During the spring semester of 1993 a management class worked together with the Agricultural Service Lab to create and distribute a customer satisfaction survey to 500 farmers and homeowners who had recently submitted soil samples. More than 50 percent responded. Among those who responded, 97 percent said the soil test results and recommendations were useful, 99 percent said the results were accurate, 89 percent said the lab reports were understandable, 95 percent said the services always were or usually beneficial, 91 percent said they were satisfied with the turnaround time, and 98 percent said the Clemson Extension office in their county was helpful when they had a question or problem.

More than 4,500 individual contacts were made, providing information on beneficial and harmful insects and fungi. Most of the contacts on insects were made in direct response to inquiries of Extension personnel. *The Agricultural Chemicals Handbook* and the *Garden Insect ID and Control Guide* were revised. Numerous presentations were made by agents and specialists at county, regional and statewide meetings.

Termites are highly visible pests. The Termite Technician Training Facility at the Sandhill REC continues to improve the technical abilities of those in the termite control business. Hands-on instruction using different structural examples has significantly improved the qualifications of technicians who have received the training.

For beekeepers, agents and specialists offered beekeeping training, conducted field days, assisted local residents with bee swarms, and provided information for students. More than 4,000 contacts were made on bee-related matters.

Eight meetings were held on shiitake and exotic mushroom production. The number of mushroom producers in the state is growing slowly. There is interest in producing mushrooms on artificial logs, and we now have a producer of artificial logs.

With boll weevils eradicated, about 30 percent of the state's cotton farmers say they spray less for boll/budworm. Foliar sprays were applied 4.5 times to control insects in 1992 compared with an average of more than 12 before eradication. Nematode surveys were conducted in 500 cotton fields, with damaging nematode levels found in 50 percent.

This year represented the last of three years of funded cooperation between the S.C. Forestry Commission and Clemson Extension in addressing the needs of private landowners recovering from Hurricane Hugo. Several resources were developed which will contribute to the ongoing reforestation emphasis.

A field tour was conducted for 37 professional foresters and land managers. At nine field locations this tour showed a variety of forest vegetation management options. A presentation on the impact of Hurricane Hugo on private landowners' attitudes and perceptions was given in a pre-conference workshop at the 1993 annual meeting of the Appalachian Society of American Foresters. Three publications were developed related to the hurricane recovery effort.

Two workshops on stewardship cross training were conducted in Florence and Orangeburg for foresters and other land and resource managers. These workshops provided 203 professionals with basic training in subjects outside their normal areas of expertise. The demonstration Stewardship Forest at Camp Harry Daniels has been fully developed and programs were designed to use this unique setting in future education programs.

The emphasis on urban and community forestry continues to expand. Arborist certification workshops and examinations were developed, and 298 tree-care professionals attended 10 workshops in South Carolina and throughout the South.

Extension forestry personnel worked closely with the Teaching KATE (Kids About The Environment) program this year. More than 3,000 students have participated in Teaching KATE. In addition to the Teaching Kate program, in-school presentations were made to more than 600 elementary and middle-school students.

A two-year grant for developing and using forestry-related best management practices in South Carolina was secured from the Environmental Protection Agency. This will be used to develop and promote sound practices, especially in areas of environmental sensitivity.

Through its marine extension program, Extension has delivered educational programs to foster awareness of the need to promote positive actions to ensure the sustainability of coastal natural resources. The city of Hilton Head purchased an office complex site and renovated it as the new city hall. Working with Extension agents and specialists, the city is developing the site as a demonstration of xeriscaping to promote water conservation and quality enhancing practices by homeowners and industry professionals.

At a marine camp conducted by Extension this year, more than 300 youth received information on environmental education and water quality.

An Extension "Energy-Efficient Shrimp Net Program," funded through the governor's energy office, was developed by a marine Extension agent for use by commercial shrimpers in coastal counties. The study focused on how new materials can be used for shrimp nets that will cut fuel use and cost on shrimp boats. Results of the program helped commercial shrimpers reduce operating costs and increase profitability.

Adults and youth need to increase awareness of environmental issues and develop an environmental ethic. The Coastal Nonpoint Source Pollution Project seeks to identify nonpoint sources of pollution in Charleston Harbor and to provide educational resources to homeowners and municipalities in the harbor area to help reduce such pollution. Extension staff, including volunteer Extension Master Gardeners, is working with homeowners and home-owner groups to increase awareness of practices that can reduce nonpoint water pollution.

During the last year the Clemson Extension wildlife program focused on the following programming areas: integrated land management for wildlife, economic impact of wildlife on rural communities, youth education in wildlife, natural resource management, wildlife damage management and conflict resolution in issues regarding the use and management of wildlife.

Those involved in Extension wildlife programming prepared 15 publications and journal articles and presented numerous workshops, short courses, conferences and training programs.

The integrated agricultural, forest and wildlife demonstrations were continued on University property, and a demonstration on ways to reduce deer damage to crops with resistant varieties and electric fencing was developed.

Investigations undertaken during the year included control of crop depredation by deer, a multifaceted team approach, and youth attitudes about hunting, a continuation of a study of responses of youths to surveys before and after adult/youth hunts.

Family and Youth Development

Food Quality, Food Safety, Nutrition and Health

The state's morbidity and mortality statistics are alarming. Life expectancy is among the lowest in the country, and deaths from heart disease, cancer and stroke exceed the national average. Food consumption during childhood and adolescence may be related to the incidence of chronic disease in later life. The relationships be-

tween nutritional status, food consumption and health will continue to be priority programs for Extension.

This year programs were conducted on making wise food choices as a way to improve health and selecting diets that are nutritionally adequate for the lifecycle. More than 700 programs were presented in cooperation with agencies such as the Commission on Aging and the S.C. Department of Education.

Other efforts in food and nutrition include: more than 4,000 adults enrolled in the Expanded Food and Nutrition Education Program, food safety updates, food procurement and preparation aimed at utilization of available resources, and teaching dietary guidelines to youth and adults. Other efforts in health education include endorsement of smoke-free work places and participation in a cancer project in the Appalachian Mountains.

In family life and human development, Extension continues to provide leadership in teen pregnancy prevention, alcohol and drug abuse prevention and parenting renewal. Through collaboration with other groups, programs that focus on building self-esteem, coping techniques, communication skills, decision-making and technical knowledge are implemented.

The computerized Family Information Network reached almost 40,000 persons, providing information on the availability of dependent care for the young and elderly. This network is available through the Clemson Extension office in each county.

Helping S.C. families and youth make wise consumer decisions has been the focus of the Extension family resource management program this year. South Carolina has approximately 3.5 million consumers of goods and services. Efforts have been directed at helping consumers understand the marketplace and the choices available. Particular attention has been given to helping the elderly avoid fraudulent schemes and appropriate consumer recourse.

In the area of financial management, program materials in wills/estate planning and debt management were developed.

Additional emphasis was put on helping consumers select, use and care for household equipment. There are 1,150,000 households in South Carolina. The Extension Service provided information on household management practices which addressed the needs of homeowners and renters.

Entrepreneurial efforts centered around the popular "Sewing As A Business" project. The textiles and clothing program has helped 200 home sewers turn their skills into profits. Almost half the participants now have regular income as a result of this week's training. The clothing and textiles management program has reached 1,200 youth and almost 400 volunteers with information on wardrobe planning, selection and care and maintenance, including handling of pesticide-contaminated clothing.

In housing, Extension home economists helped S.C. families plan new or remodeled homes, improve home pest control and safety, identify and select alternatives to the single family home, and plan new or adapted housing that would be accessible throughout life.

Thirty-four counties reported helping families with housing issues including radon and other indoor air quality problems. Housing affordability continues to be a major problem for S.C. families. Working cooperatively with housing groups, Extension presented information on family budgeting and financial management, credit management, the process of buying a home, home management, home maintenance and repair, and landscaping/yard care. As a result of these efforts, 68 limited-resource clients set and attained affordable housing goals.

Major emphasis in youth development education has been in developing coalitions to work with at-risk youth and community councils to sponsor after-school homework centers. About half the counties in the state are involved in programming for youth-at-risk, and approximately one fourth of all counties now take part in the Visions for Youth homework center program. Both of these efforts focus on building self-esteem in young people and developing specific skills.

The 4-H youth development base program continues to reach more than 60,000 young people, ages 5-19. The base program teaches lifeskills through the delivery of subject matter in agriculture, home economics, citizenship, leadership, performing arts and career education programs. The "Go for the Goal" career exploration program, developed at Clemson, is utilized in 42 states.

Priority initiatives within the youth development program for 1992-93 were natural resource and environmental education, and science and technology. Teaching KATE is an on-site environmental program for children. It is coordinated by a natural resource coalition and is offered at the 4-H Leadership Centers. More than 3,000 school age children have participated in this program that teaches environmental stewardship. This program is in addition to the 4-H camping program which reaches more than 6,000 young people annually.

A \$300,000 grant was awarded to 4-H for a PEAK (Professional Educators' Access to Knowledge) project to prepare school teachers to offer an expanded science and technology curriculum.

Volunteerism is encouraged at all levels of programming. The 4-H youth development education program actively encourages teen leadership among junior and senior high school students. Similarly, Clemson University hosts the most outstanding collegiate 4-H Club in the nation in 1993, based upon the club's efforts to mentor younger teens.

Adult volunteerism is focused on 4-H volunteer leaders, Family Community Leadership training and on members of the S.C. Association of Family and Community Education. The current focus of these groups is leadership development, public policy education, family issues (children), the environment (waste management) and global issues emphasizing literacy.

DIVISION OF REGULATORY AND PUBLIC SERVICE PROGRAMS

The Division of Regulatory and Public Service Programs, formed in 1970, comprises the director's office and four departments: Fertilizer and Pesticide Control, Plant Industry, Seed Certification and a portion of Agricultural Chemical Services.

The division's mission is to enhance the quality of life, agriculture, environment and dwelling for South Carolinians by ensuring compliance by regulated industries and individuals with federal and state legislative mandates.

Our programs promote the use of certified seed and plants; provide the services needed for certification of crop plants; assure that fertilizers, lime, pesticides and seed meet the standards to produce marketable, safe and profitable crops; provide inspections to monitor pesticide treatments by pesticide applicators; regulate the structural pest control industry; and monitor anti-syphon devices on farm/nursery/turf irrigation systems that supply pesticides and/or fertilizers along with water.

We also provide inspections to assist the state's plant industry in certifying plant material and agricultural commodities to be apparently pest free; maintain the honey-bee health of the state through eradication, quarantines, regulatory treatments and permitting; eradicate noxious plant pests such as the cotton boll weevil and the parasitic witchweed from the state; and ensure that abandoned fruit orchards do not become a menace to nearby producing orchards.

The following activities, by department, highlight the division's work for 1992-93.

Department of Fertilizer and Pesticide Control

The Department of Fertilizer and Pesticide Control is responsible for education and enforcement of the provisions of a number of laws and regulations. The S.C. Fertilizer Law and the Liming Materials Act primarily are designed to ensure that consumers receive high quality fertilizer and lime. The Pesticide Act regulates pesticide storage, sale and use, plus such areas as quality of manufacturers' production and all aspects of pesticide and structural pest control.

Some of the major activities of this department relative to fertilizer and lime from July 1, 1992, to June 30, 1993, follow:

Fertilizer tons sold.....	536,336
Fertilizer samples procured and analyzed.....	4,038
Fertilizer samples not meeting guarantee.....	577
Lime material and samples procured and analyzed.....	189
Total number of liming material samples not meeting guarantee.....	6
Percent of liming material samples deficient.....	3.0
Fertilizer penalties collected, payable to state treasurer**	16,618.32
(Deficiencies where consumers not identifiable)	
Lime penalties collected, payable to state treasurer**	0.00
(Deficiencies where consumers not identifiable)	
Fertilizer registration fees collected, payable to state treasurer** ..	40,370.00
Lime registration fees collected, payable to state treasurer**	810.00
Lime permit fees collected, payable to state treasurer**	750.00
Fertilizer taxes sent to state treasurer**	122,380.89
Soil amendment registration fees.....	300.00
Soil amendment inspection fees	13,327.70

** Actually recorded by state treasurer July 1, 1992 - June 30, 1993, but may not correspond to final fees paid for the fiscal year.

The fertilizer tonnage sold this year decreased by .1 percent from 1991-92. Overall, 14.3 percent of fertilizer samples did not meet the guarantees within the investigational allowances. Other than deficiencies, the greatest problem in the fertilizer and lime areas continues to be the lack of proper labeling of bulk material.

The S.C. Pesticide Control Act mandates quality control monitoring and regulates the sale, use and application of all pesticides used in South Carolina. This department uses a strong preventive violation/education program coupled with fair enforcement actions to help ensure productivity while preventing adverse effects on man or the environment.

To improve its education and enforcement capabilities, the department has pursued external funding without decreasing the flexibility of the pesticide program. These efforts have resulted in a \$757,217 grant from the Environmental Protection Agency. The department also has made a concerted effort to increase efficiency by using state-of-the-art data management. Legislation passed during 1992 revises pesticide registration fees and allows the department to keep all registration fees exceeding \$140,000 and Pest Control Operator license fees to \$50,000. All other fees are sent to the state treasurer.

In 1992-93, 865 companies registered 7,912 pesticide products for sale in South Carolina. The department collected and analyzed 408 pesticide samples. Inspectors found three deficient in the guaranteed percentage of one or more ingredients and issued stop-sale notices. The department collected \$514,831.50 in registration fees.

Using provisions of the Federal Pesticide Control Act, the department issued seven section 24 (C) special local need registrations. The EPA granted two section 18 emergency exemptions solicited by the department.

Pesticide dealers and applicators must be certified and licensed to buy, sell or apply pesticides classified for restricted use. As of July 1, 1993, the number of applicators licensed was: 12,551 private applicators licenses, 2,283 commercial applicators licenses, 735 noncommercial licenses and 330 pesticide dealers licenses. Certification fees collected totaled \$57,822.90. A total of 759 business licenses produced \$54,805.60 in revenues.

In the area of education and enforcement, the department's specialists made frequent contact with pesticide users, including dealers, growers, applicators and consumers. The structural pest control area requires particular attention. The pesticide act was amended to increase the insurance/bond requirement to become licensed as a commercial applicator.

Enforcement actions against violators were decisive but fair. As part of the EPA/Department of Fertilizer and Pesticide Control Cooperative Enforcement Grant, the department made 113 marketplace inspections, 458 certified applicator record checks and 388 restricted-use pesticide dealer inspections.

The department levied 51 civil penalties ranging between \$250 and \$8,000 and totaling \$29,400. Investigators pursued 921 cases of potential pesticide misuse, complaint or noncompliance with regulations. They issued numerous stop-sale notices for unregistered products, sale of restricted products by unlicensed dealers and other alleged violations. The department issued warning letters in 168 cases. Overall compliance with the act by members of the agribusiness industry has been excellent.

Department of Plant Industry

The mission of the department is to prevent the introduction and spread of plant and honey bee pests into, within, and from South Carolina through plant pest exclusion, quarantines and eradications; plant export certification; honey bee pest exclusion; nursery, greenhouse and transplant certification; boll weevil eradication and elimination of abandoned orchards. This mission is directed by a number of laws and regulations.

Activities this year included:

Nursery Inspections: By provisions of the Crop Pest Act, Plant Industry licensed 604 nurseries, greenhouses and vegetable transplant growers and 1,072 nursery dealers to sell plant material. Plant Industry specialists visited an additional 695 establishments to determine compliance with quarantines and plant pest regulations. Forty-eight nurseries failed seasonal inspections due to pests, weeds or other problems. One specialist issued a stop-sale, seizure order for plants considered a public nuisance. The department processed 33,900 permit tags for nursery stock movement.

Phytosanitary Certification: Plant Industry issued 259 state phytosanitary certificates for exported plant material. The certificates covered orchids, chrysanthemum and poinsettia liners, soybean seed, okra seed, propagated native plants, dahlias, anthuriums and pine lumber. The plant material was shipped to other states or U.S. possessions and 20 foreign countries.

Special Inspections: Plant Industry specialists processed 15 plant inspection certificates for homeowners moving house plants to other states. The department provides this public service when the receiving state requires house plant inspection. People relocating to Florida accounted for 67 percent of these requests. Pee Dee tobacco transplant growers requested special inspections allowing sale of 1,435,000 transplants to N.C. growers.

Phony Peach Disease: Two temporary inspectors and two Plant Industry specialists surveyed peach orchards in the state's Ridge and Coastal Plains for phony peach disease. Disease incidence in 1992 was 289 trees out of 1,846,837 inspected, or .02 percent.

Sweet Potato Inspection: Specialists made 25 pest detection inspections for eight growers in the Pee Dee, Sandhill and Coastal Plains regions, certifying the plant material for sale.

Introduction of Honey Bees Into State Act: The state apiary program included inspection of 82 apiaries, representing 975 colonies of bees. Two common pest problems were chalkbrood and European foulbrood. One colony infected with American foulbrood was destroyed by burning. Tracheal mites continued to cause colony losses in the state. At present, Varroa mites infest state resident honey bees in 25 counties. Africanized honey bee swarms did not occur in the state this year. The department monitored honey bee swarm traps placed at high risk inland locations in the state. Five swarms captured so far this year were European honey bees. The swarm traps supplement swarm monitoring being done by USDA at the Charleston, North Charleston, Beaufort and Georgetown ports.

Neglected or Abandoned Orchards Act: Abandoned fruit orchards generally cause a buildup of orchard pests that affect other fruit growers in the area. Under the act, the department identified six properties totaling about 168 acres as containing abandoned fruit trees. The properties are in various stages of owner notification and tree removal.

Cooperative State/Federal Programs: Plant Industry and USDA renewed a cooperative agreement in 1992. The agreement created temporary survey and control activity jobs in the witchweed program, but the gypsy moth effort was greatly reduced because of federal funding reduction. Plant Industry hired about 30 people for the witchweed program.

The witchweed infested acreage continues to be reduced. Only 8,876 infested acres in four counties remain in the state. Total net acres released from quarantine in 1992 was 804. Contractors treated 10,000 acres this season. Eradication efforts have led to the release of 72,451 (89 percent) net acres from quarantine since the program's beginning.

Surveyors installed 5,613 gypsy moth survey traps at priority sites or in selected grids in all counties of the state in 1992. A total of 54 traps caught 79 adult male moths during the season. Horry County accounted for 55 moths. Moths were trapped in Anderson and Chester counties for the first time. These were new county records.

The boll weevil eradication program continues to be successful. Only 10 boll weevils were caught statewide in 1992. One weevil has been trapped in 1993 in Aiken County. South Carolina had 196,030 acres of cotton in 1992. About 950 growers paid fees of \$784,120. A General Assembly appropriation of \$184,800 reduced acreage fees paid by cotton growers in 1992. The grower's per acre assessment rate in 1993 is \$3.50.

The imported fire ant occurs in all 46 counties of the state. Thirty-nine counties are totally infested and under quarantine. Seven counties in the upper Northwest section of the state are only partly infested. The total infested acreage is approximately 17.3 million acres. The department has increased its effort under a cooperative agreement with USDA to prevent the spread of imported fire ants through infested nursery stock. Thus, increased contacts, visits and inspections of nurseries, turf growers and other establishments will continue to inform, educate and assist S.C. producers.

Seed Certification

Seed certification is a program of standards imposed on the seed and plant production industries that ensures varietal purity, good germination and freedom from noxious weed seeds. Participation in the program is voluntary.

In 1945 the General Assembly designated Clemson as the agency to inaugurate and carry out a program of certification of pure seed and plants.

Department field work in 1992-93 involved inspections of 26,709 acres of crops for certified seed production. Inspections included 72 varieties of 14 crops for 133 farmer/growers and 32 seed-producing firms. Inspectors checked each field to determine that the crop was true to variety and free of noxious weeds and seed-borne diseases.

Acreages of major crops inspected were: soybeans, 16,022; small grains, 8,208; cotton, 1,491; peanuts, 427; grasses, 297; and pine trees, 246. The department also field inspected as a service to the industry 3,081 acres of a flax variety that was ineligible for certification. Other field work included grow-out plantings of 498 samples representing 257 lots of S.C. certified soybean and small grain seed to verify proper sampling and labeling.

During 1992-93 the department issued 515,802 certified tags and approved 213,685 certified bags with pre-printed labels for growers whose seed met standards in the field and laboratory. Department inspectors examined and approved 26 seed conditioning plants for custom conditioning of S.C. certified seed during the year.

Agricultural Chemical Services

This department performs the chemical analyses reported by the Department of Fertilizer and Pesticide Control.

Laboratory technicians analyzed 408 pesticide samples and 150 soil samples for termiticides. In addition, the technicians examined 325 ground water samples for 22 pesticides. The department also conducted analytical procedures on more than 4,000 fertilizer and 200 lime samples, most of which required multiple analyses.

The department performed more than 30,000 analyses for the S. C. Agricultural Experiment Station. The Agricultural Service Laboratory processed more than 29,000 soil samples, 3,800 plant samples, 2,300 feed samples and 2,600 nematode samples.

LIVESTOCK-POULTRY HEALTH DIVISION

The Livestock-Poultry Health Division conducts a number of regulatory programs in consumer protection, animal health and the diagnosis of various diseases in S.C. livestock.

The division's three main responsibilities are the administration of the Animal Health Programs, the Animal Diagnostic Laboratory and the S.C. Meat and Poultry Inspection Programs.

Animal Health Programs

The Livestock and Poultry Health Programs provide protection to the human population as well as to animals.

A major public health role is provided by this organization through many animal health programs which have virtually eliminated numerous zoonotic diseases. We continue to furnish surveillance on brucellosis, tuberculosis, Eastern equine encephalitis and other diseases contagious to man.

We currently administer very successful programs in control and eradication of pseudorabies and equine infectious anemia. We also provide surveillance for the entry of foreign animal diseases. Livestock-Poultry Health is responsible for the enforcement of our animal health laws and regulations.

Animal Diagnostic Laboratory

The laboratory provides a network of services to assist veterinary practitioners, livestock and poultry producers, regulatory agencies and pet owners with disease diagnostic problems. These services include post-mortem examinations and histopathologic evaluations of tissues derived from post-mortem examinations as well as from biopsy specimens submitted from private practitioners.

In addition, the lab provides support such as bacteriological culture, virology and serology services.

In conjunction with the Department of Agriculture, the lab performs toxicological evaluation of tissues when required. The laboratory is involved in the diagnosis of diseases of public health significance such as chlamydiosis, mosquito borne encephalitis and rabies. In cooperation with the National Poultry Improvement Plan, the laboratory monitors egg-type chicken breeder operations for the presence of *Salmonella enteritidis*.

During the 1992-93 fiscal year the laboratory received and processed more than 23,447 sample accessions, which included 2,000 post-mortem examinations of poultry species and 1,000 examinations of mammalian and reptilian species.

The laboratory conducted histological evaluations of more than 2,000 mail-in tissue biopsy and cytology samples in addition to the histologic evaluation of the post-mortem tissues. Lab personnel performed more than 20,000 tests on the surveillance of equine infectious anemia (Coggin's tests) and more than 2,500 bacterial culture and sensitivity tests.

The case load continues to grow annually. With recent state appropriations, the laboratory is attempting to accommodate the increased demand for services by updating equipment such as tissue processing and embedding instruments and purchasing new equipment including hematology and clinical chemistry analyzers, microscopes and laboratory work stations. The installation of a centralized computerized system for the handling of case information, veterinarian directories and case reports should increase the efficiency of case data correlation and reporting to our clients.

Meat and Poultry Inspection

The S.C. Meat and Poultry Inspection Department serves as a public health regulatory agency which is responsible for ensuring that inspected meat and poultry products are safe, wholesome and accurately labeled.

The U.S. Department of Agriculture conducted a month-long, comprehensive review of the entire operation of the state meat-poultry inspection program during February 1993. The state program was rated "at least equal to" the federal program, and as a result another review will not be scheduled until 1997.

The department continues a microbiological monitoring program for the presence of salmonella, listeria and campylobacter organisms in cooked meat products. The Animal Diagnostic Laboratory has the capability to conduct these tests in support of the meat inspection program and recently arranged for additional training for its technologist at the USDA laboratory in Athens, Ga.

For several years we have maintained an active monitoring and surveillance program for chemical residues in tissues of food animals. This program involves in-plant testing for the presence of antibiotics and sulfonamide residues, submission of tissues for laboratory examination and on-farm investigations of all identified violators. These on-farm investigations primarily are used as public health education to

assist producers with identification of problems and prevention of recurrence.

The use of traditional organoleptic inspection procedures together with these bacteriological, chemical and histopathological monitoring techniques results in a more balanced meat-poultry inspection program. We currently are inspecting 95 red meat plants and nine poultry plants.

COLLEGE OF FOREST AND RECREATION RESOURCES

Founded in 1970, the College of Forest and Recreation Resources is dedicated to meeting the needs of South Carolina, the nation and our global community through aggressive education, research and extension programs for the wise management of our natural resources and for enhancing the quality of life for our citizens. This mission is carried out by our constituent departments and institutes of Forest Resources; Parks, Recreation and Tourism Management; Aquaculture, Fisheries and Wildlife; the Archbold Tropical Research Institute; The Belle W. Baruch Forest Science Institute; Regional Resources Group; and the Recreation, Travel and Tourism Institute.

Our college programs extend beyond our students and industry groups and directly touch the lives of S.C.'s citizens through program areas such as the PRTM Outdoor Laboratory, recognized by its peers as the finest university facility of its type nationwide. For example, the Outdoor Laboratory has various resident camps: Camp Sertoma (hearing impaired and disadvantaged youths), Camp Hope (mentally retarded and emotionally disturbed citizens), Camp Lions Den (visually impaired youths), and Camp Running Brave (hemophiliacs). Through these camps the Outdoor Laboratory strives to improve the quality of life of these very special people and their families. Our Extension Forest Resources offices serve every county of the state with special needs of that county and region. The Belle W. Baruch Forest Science Institute on a 17,500 acre tract in Georgetown, S.C., is dedicated to research and education in forestry in the coastal plain areas of the state. The Regional Resources Development Institute, in cooperation with the Strom Thurmond Institute and this college, examines issues in natural resources allocation and community development throughout the state and region. Our college also has a well-respected continuing education effort. For example, we are a primary training site for the U.S. Forest Service short courses in silviculture, harvesting and sales layout, recreation, and various computer-based applications.

Our college's pursuit of excellence extends beyond the state as well. With the establishment of the Archbold Tropical Research Center on the island of Dominica in 1989, our scientists and students have an opportunity to work with the Caribbean, Central American and South American cultures and governments to provide leadership and expertise in various fields of study. Due to our work through the Archbold Tropical Research Center, we are attracting students and faculty from around the world.

The college also has strived to keep abreast of the changes in computer technologies. With state-of-the-art facilities in Geographic Information Systems and P.C. laboratories, our college has opened new teaching and research opportunities for our faculty and students.

Department of Forest Resources

Forests and forest industry are a large part of South Carolina. Sixty-four percent (12.2 million acres) of the state is commercial forest land, and forest industry is S.C.'s third largest manufacturing industry, followed only by chemicals and textiles. The annual value of all forest products industry shipments is about \$5 billion.

The Department of Forest Resources is an integral part of the University's land-grant mission. The department's goal is to provide the citizens of South Carolina, the nation and the world:

- Undergraduate and graduate educational programs that (1) produce forest management and forest products specialists of the highest professional competence and integrity, and (2) expose non-majors to the understanding, wise use and management of the forest and its products.
- Forestry and forest products research programs that furnish the scientific expertise and leadership required for technical advancement, wise management and utilization of the forest resources.
- Direction and technical guidance by presenting existing knowledge and new research results in a usable form to forest landowners, the public, resource professionals, wood products firms and conservation-oriented organizations.

The Department of Forest Resources' programs in education, research and extension are unique within the state. The department plays an important role in educating new and practicing forest resource managers. During the past academic year 24 B.S. degrees, six master's and two Ph.D. degrees were awarded. Our undergraduate curriculum was revised significantly and now offers a single degree in Forest Resources Management with the opportunity to minor in more than 40 different subjects, including Forest Products. In addition, the department's Forestry Continuing Education (FORCE) Program had 12 formal programs, ranging between one day to six weeks in length, which were attended by 365 professionals.

Official notice of the department's continuing accreditation by the Society of American Foresters was received during the year. A research review was performed by the Cooperative State Research Service. The reviewers found the department had very good research support, despite current fiscal stringencies and made many useful suggestions.

Many faculty were actively engaged in research. More than \$1 million in external support, for the third year in a row, was generated for these and our outreach programs. Several projects had particular importance for South Carolina and the South. A second Best Management Practice (BMP) report, following last year's survey, was titled "Implementation and Effectiveness Monitoring of Forestry BMP's on Harvesting Sites in South Carolina." It recommended revision of silvicultural BMP manuals, education for all landowners, emphasized the identification and protection of sensitive sites, and preharvest advice from state agencies to mediate environmental impacts. Another project, in partnership with forest industry, is titled "Monitoring of Ash Recycling to Assure Environmental Safety" and is investigating the recycling of ash from pulp mills.

Three research areas have been identified for particular emphasis within the department: Ecological Forest Management, Forested Wetlands Management and Science, and Improved Utilization of Southern Pine Juvenile Wood. The program in wetlands is well established with four full-time and many part-time scientists involved. Further, a \$6 million endowment program was initiated during the year. The programs in ecological management and juvenile wood still are being formulated.

In addition to the FORCE Program discussed above, Extension efforts have focused on landowner education in managing Hugo-damaged lands, the S.C. Forest Stewardship Program, and urban and community forestry. Our "Teaching KATE (Kids About the Environment)" partnership also has been extremely successful. During the year a full-time and part-time training center was established, week-long training sessions were conducted for those who teach KATE, and more than 3,000 students attended Teaching KATE programs.

Department of Parks, Recreation and Tourism Management

Teaching

Teaching personnel in the Department of Parks, Recreation and Tourism Management (PRTM) are dedicated to excellence in education at the bachelor's, master's and doctoral levels.

Professional preparation by our students leads to careers in public and private leisure services agencies including: county and municipal leisure services administration; youth serving agencies; federal, state and county recreation and park resource management; therapeutic recreation program delivery systems; and, the broad field of travel and tourism management. PRTM-related careers make up a \$400 billion industry nationally and a \$6 billion industry in South Carolina. Furthermore, preparation at the doctoral level is directed toward research and instruction in academic settings.

Fall 1992 enrollment figures for the department are shown below:

Undergraduate	330 students
Travel and Tourism.....	50 percent
Resource Management	20 percent
Therapeutic Recreation	15 percent
Community Leisure Services.....	15 percent
Graduate	63 students
M.P.R.T.M.....	37 percent
M.S.....	14 percent
Ph.D.	9 percent

Highlights within PRTM's instructional program for the 1992-93 year included:

- PRTM continued its participation in Telecampus, a unique graduate level, educational outreach program available to practicing professionals throughout South Carolina.
- PRTM held its third student assembly in September. The assembly provided an opportunity for Larry Allen, head, to introduce the faculty to all PRTM majors, describe PRTM's mission, introduce practicing professionals, and expose newer students to the student clubs and associations in PRTM.
- PRTM's teaching effectiveness was assessed via in-class visitations and evaluations conducted by the department head.
- Quarterly student luncheons with the department head were held to seek feedback from approximately 25 undergraduate students at a time.
- Neville Bhada, a PRTM graduate student, received the J. Desmond Slattery Marketing Award from the Travel and Tourism Research Association. This is one of the most prestigious international awards for graduate students in the Travel and Tourism discipline. This marks the third year in a row that a PRTM graduate student has won this coveted award.
- Sheila Backman, a faculty member, was first runner up in the doctoral competition (1988-1992) sponsored by the Academy of Park and Recreation Administration.
- Wes Burnett, a faculty member, was included in "Men of Achievement" by the International Biographical Center, Cambridge, England.
- Fran McGuire, a faculty member, was elected as a fellow at the Strom Thurmond Institute.

Research

Faculty had another successful year, receiving 37 grants and contracts amounting to \$1,187,000 in new research and related activities. They continue to pursue research which will bring national visibility to Clemson University and South Carolina. This is especially true for developing guides for marketing plans in S.C. tourist regions.

Faculty made 22 research presentations at national and regional meetings and 48 other professional presentations to a variety of audiences. Graduate student presentations were encouraged, and presentations by these students representing Clemson also were productive. Faculty and graduate students generated 49 publications, with 23 of these appearing in national refereed journals. PRTM faculty also published four books and three book chapters during 1992-93. Faculty are repeatedly requested to serve as referees of research publications and serve on editorial boards of several professional journals.

Public Service/Extension

The department's commitment to education extends beyond involvement with undergraduate and graduate students to include ongoing and other successful programs aimed at a variety of audiences. Some of the public service activities during fiscal year 1992-93 included:

- College Week for Senior Citizens, two one-week programs served nearly 300 citizens from South Carolina and the surrounding region.
- Gina McLellan conducted four short courses for the U.S. Forest Service. These programs were two- and three-week programs with several nationally known speakers in addition to PRTM's own faculty.
- The Recreation, Travel and Tourism Institute has established a strong network within the tourism industry and is developing several cooperative ventures opportunities with various public and private groups.
- Faculty served on professional boards, editorial boards of national journals and held offices in professional associations.
- Butch Trent, a faculty member, was honored when the University Union established the Buford E. Trent Award for outstanding student involvement in the Union.
- The S.C. Rural Recreation Development Project served seven communities this year including Bamberg, Blackville, Central, Edgefield, McCormick, Pageland and Ridgeland. The program, which provides recreation programs and services via a local recreation director, was extremely successful and served more than 22,000 rural residents this past summer.

Clemson University Outdoor Laboratory

In 1992-93, excluding summer camps, the Clemson University Outdoor Laboratory served 14,481 people from 259 different groups. Including summer camps, at least one group used the facility for 343 days during the 12 month period.

The summer camps were filled to capacity with more than 900 children, teenagers and adults with special mental and physical needs. More than 50 college students worked at the Outdoor Laboratory during the summer months. Returning camps included Jaycee Camp Hope (mentally disabled), Camp Sertoma (speech and hearing impaired), Lions Den (blind), Running Brave (hemophilia), and Camp Tiger (muscular dystrophy). A new program called Camp Cherith was conducted in August for 200 campers and staff. This interdenominational program for children and teens has requested permanent summer dates for future use.

The S.C. Jaycees raised more than \$60,000 to support Jaycee Camp Hope. Of that, \$35,000 was used to subsidize the camp according to arranged terms, \$12,500 went to complete an endowment drive, and the balance was used for special projects in support of the summer camp.

The S.C. Sertoma board of trustees sponsored six weeks of summer camping for more than 260 children. The trustees also made tremendous progress in endowment growth toward a goal of raising \$500,000 in support of Camp Sertoma. Former U.S. Rep. Liz Patterson agreed to serve as honorary chairman for the drive, and a kickoff rally was held in Columbia in May.

In three fall sessions of Senior Adventure Camp, more than 100 persons were served. Several University classes were involved in program development and program delivery, giving students excellent opportunities for practical training. This was the 23rd year of serving senior adults through residential camping activities.

Eight schools were served through spring season Outdoor Lab environmental education programs. All available dates were used. Again, students at Clemson were used in many ways to support the activities. Some faculty and staff also volunteered to teach or serve as resource persons.

In March, the fifth annual PUSH CAMP (People Understanding the Severely Handicapped) was conducted. Twenty-eight Pi Kappa Phi brothers from across the country spent their spring break at the Outdoor Lab, building projects to support the summer camps. Along with the manpower, the group brought \$6,000 in financial support to underwrite their work. The S.C. Jaycees also matched the PUSH grant. Completed projects included a new amphitheater, rebuilt cabin porches, a new dock, erection of a new flagpole and trail improvement.

For six weekends, a new program in Respite Care was held. This program provided respite opportunities to the parents of disabled children by allowing them to enroll their child in the Outdoor Lab program. The facility was licensed by the S.C. Department of Disabilities and Special Needs, and funding was provided by the Anderson and Pickens counties departments of the same agency. A core of Clemson students was certified to provide care, and the response was tremendous from both the parents, the participants and the agency personnel. Six weeks already are scheduled for 1993-94, with one weekend set aside for residents of Chesterfield County and the others for Pickens and Anderson.

The Outdoor Laboratory was reaccredited by the American Camping Association in July. Months of intense effort was given to preparation, and notification was received in October that the programs and facilities had received reaccreditation for another three-year period. Such status means that the standards of operation meet or exceed the highest professional standards in the industry.

More attention is being required to maintain components of the total complex, many of which are approaching 20 years of use. Much time has been devoted during the year to identify individuals and organizations who might be able to provide financial or materials assistance. This will continue to be a high priority during the coming year.

Computer Laboratories

The past year was very successful for the college's PC Laboratory. The facility was upgraded to fast 486-based personal computers. The new PC's reflect a timely addition to the teaching efforts within the college. Students now can take advantage of current, window-based software as well as utilize the more familiar disk operating system-based software. Also made available within the PC Laboratory this year was a Macintosh computer. This piece of equipment provided students with an exposure to other operating environments and software applications and proved to be very popular.

A full complement of software is available within the laboratory, including word processing, spreadsheet, database, statistics, graphics, specific forestry and recreation applications, and telecommunications software. In a continuing partnership between the college and the National Park Service, two versions of PC-based Geographic Information System (GIS) software have been purchased. These software packages not only will enhance practitioner capabilities in the field via in-service

training, but will assist graduate and advanced undergraduate students in addressing a multitude of natural resource management and research issues.

Numerous courses within the college provide students with the opportunity to utilize computer applications in solving problems and challenges facing today's forestry and leisure services industries. As well as instruction for undergraduate and graduate students in the college, the PC Laboratory was utilized by personnel from federal land-managing agencies such as the U.S. Forest Service and the National Park Service for in-service training purposes. Total use of the PC Laboratory exceeded 17,000 participant hours last year.

Along with the upgrading of the primary PC facility, the college recently established a smaller, second PC Laboratory within Lehotsky Hall. Twelve older PC's from the larger PC Laboratory were placed in a multi-use room after the original machines had been revamped. Now students in the college have ready access to 28 stand-alone PC's and nine other PC-to-mainframe terminals.

This past year also marked the third year of operation for the Geographic Information System Research Laboratory, a third computer laboratory in the college. Stemming from a partnership with the U.S. Forest Service, this laboratory conducts joint research regarding natural resource management models utilizing spatial data analysis. During the past year it continued to engage in natural resource management research projects ranging from ecosystems management to wetlands management.

With the improvements in computer resources during the past year, the College of Forest and Recreation Resources continues to remain committed to a leadership role both in the forestry and leisure services fields. Partnerships, such as those with the National Park Service and the U.S. Forest Service, are an important means of maintaining this leadership role.

Archbold Tropical Research Center

Clemson University received the donation of the Springfield Plantation from honorary Dr. John D. Archbold in May 1989. In response to this donation, the Archbold Tropical Research Center was created. The center functions as a teaching, research and public service consortium of leading institutions. Its mission is to promote undergraduate and graduate education and research in tropical ecology, conservation biology, natural resources management, nature tourism, island culture and sustainable economic development.

Facility Maintenance and Improvement

We continue to improve the quality of the facilities for teaching and research. We have renovated the old garage building into a field laboratory and have installed a library and a herbarium in the guest house. We also have completed the renovation of one of the service buildings into a new two-bedroom cabin for visiting researchers. We also have completed the renovation of the two-story Stream House which now serves as a second dormitory to Mt. Joy, allowing us to run two classes at the same time.

We also have several agroforestry and tropical agriculture demonstration plots in place for student and research use. A nature trail is being developed for the property.

Use of Springfield by Nature Tours, Classes and Non-Governmental Organizations (NGOs)

The use of the facility in 1992-93 increased greatly when compared with 1991-92. Springfield now attracts visitors from all over the world.

I. Use of Springfield by Teaching, Workshop, Classes and Nature Tourism Programs

1992-93 Schedule

USDA Forest Service Project	.....November 15-24	.....Lectures
Dominica High School groups	....November 10-11	.....Field Project
USDA Forest Service Project	.....December 7-9	.....Workshop
USDA Forest Service Project	.....December 14-16	.....Workshop
SUNY-ESF (Tropical Ecology)	...March 4-15	.....Class
U.S. Peace Corps	.....March 12	.....Liaison Workshop
USDA Forest Service Project	.....March 17-19	.....Forestry Training
Antilliance-Feesten Hoogstraten (Belgium-Ecotourism)	.....March 22-29	.....Nature Tour
Dominica High School groups	....March 8 & 10	.....Two Workshops
Trinidad Electrical Contractors	....April 9-13	.....Nature Tour
Toulon Agencies	.....May 21-23	.....Nature Tour
Texas A & M University	.....May 25 - June 14	.....Class/Field Projects

1993-94 Schedule (to date)

People to People International	.....June 13 - July 2	.....Class/Field Projects
USDA Forest Service Project and Pan American Develop- ment Foundation	.....July 11-15	.....Women/Agroforestry
Marie Galante Ecotourism	.....July 24-25	.....Nature Tour
U.S. Peace Corps	.....September 1	.....Tour for Teachers
Clemson University	.....September-October	.....Ecotourism Workshop
USDA Forest Service Project and Pan American Develop- ment Foundation	.....October 20-22	.....Women/Agroforestry
USDA Forest Service Project	.....November	.....Forestry/Training

II. Use of Springfield by Government and NGOs

Government and NGO Use

Encore Assessment Team	.....March 1992
Home Industries	.....April 1992
Civil Service Association	.....April 1992
Univ. of the West Indies (Barbados)	.....July 1992
Small Projects Assistance Team	.....July 1992
CREACOM	.....August 1992
Windward Islands Farmers' Union	.....September 1992
Small Projects Assistance Team	.....October 1992
Caribbean Natural Resources Inst.	.....November 1992
E.C.P.T.O. (local)	.....November 1992
Movement for Cultural Awareness	.....January 1993
World Wildlife Fund	.....February 1993
Small Projects Assistance Team	.....March 1993
Soil Association of U.K.	.....May 1993
Movement for Cultural Awareness	.....June 1993
Movement for Cultural Awareness	.....July 1993
United Nations Development Program	.....July 1993 (with Forest Service Project)

In addition, approximately 20 tourists interested in nature tourism visit the station every week from the cruise ship which docks on Wednesdays in Roseau. This amounts to 52 visits per year for a total of more than 1,000 annually.

III. Research Visits to Springfield Field Station

Visitor/Group	Purpose	Year
Dr. D. Pauli, Pharmacia, Austria	Biochemistry	1992
Dr. Hans Beck, N.Y. Botanical Gardens.....	Botany.....	1992
Dr. Steven Hill, Clemson Univ.	Botany.....	1992
Dr. Gil Zepeda, U.S. Forest Service	Forestry	1992
Dr. Bruce Bayle, U.S. Forest Service	Forestry	1992
Dr. Timothy McCarthy, Carnegie Museum	Zoology	1992
Dr. Brian Davies, Univ. Bradford (U.K.)	Environ. Science	1992
Dr. Walter Leal Filho, Univ. Bradford (U.K.)	Environ. Science	1992
Dr. Heinrich Kaiser, McGill Univ.....	Zoology	1992
Dr. Elwood Shafer, Penn. State Univ.....	Ecotourism.....	1992
Dr. Sybil Oldaker, Clemson Univ.....	Nursing.....	1992
Ms. Janna Gower, Clemson Univ.	Communications	1992
Dr. Nancy Chessworth, Penn. State Univ.	Ecotourism.....	1992
Dr. Hans Fridtz, Germany	Medicine.....	1992
Dr. Lee Miller, Allyn Museum, Florida	Entomology.....	1992
Dr. Robin Maille, U.S. Forest Service	Agroforestry	1992
Dr. C.W. Hart, Jr., U.S. National Museum.....	Invertebrate Zoology...1992	
Dr. Brian Kensley, U.S. National Museum	Marine Biology.....	1992
Dr. Marilyn Schotte, U.S. National Museum.....	Marine Biology.....	1992
Dr. Dieter Wasshausen, U.S. National Museum...	Botany.....	1992
Dr. Barry Webster, Univ. Winnipeg	Soil Science.....	1992
Dr. Anita Malahotra, Aberdeen	Marine Biology.....	1993
Dr. Julia Horrocks, Barbados Con. Association...	Marine Biology.....	1993
Dr. Hazel Oxenford, Bellairs Res. Inst.....	Marine Biology.....	1993
Dr. Steven Hill, Clemson Univ.	Botany.....	1993
Dr. Charles Horn, Newberry College	Botany.....	1993
Dr. Francis Schmitz, Univ. Oklahoma.....	Organic Chemistry	1993
Dr. Barry Webster, Univ. Winnipeg	Soil Science.....	1993
Dr. Brian Davies, Univ. Bradford.....	Env. Science	1993
Dr. Allen Drew, SUNY-ESF.....	Forestry	1993
Dr. Bob Werner, SUNY-ESF.....	Biology.....	1993
Dr. Henrietta Lidiard, Bradford Univ.	Marine Biology.....	1993
Ms. Heather Ewer, Penn. State Univ.	Ecotourism.....	1993
Mr. Allan Case, Penn. State Univ.	Ecotourism.....	1993
Dr. Elwood Shafer, Penn. State Univ.	Ecotourism.....	1993
Dr. Marilyn Houck, Texas Tech Univ.....	Biology.....	1993
Dr. & Mrs. Lee Miller, Florida St. Museum.....	Entomology.....	1993
Dr. Dan Sims, U.S. Forest Service.....	Agroforestry	1993
Mr. Richard Ince, Pan Amer. Dev. Fdn.	Agroforestry	1993
Dr. O.N.F. Donville, CIRAD-CA.....	Ornithology	1993
Dr. Ian Rowland, Soil Sci. Association, U.K.....	Soil Science.....	1993
Ms. Jeanette Hartley, Bradford Univ.	Entomology.....	1993
Dr. Mark Day, Aberdeen Univ.	Herpetology.....	1993
Dr. Richard Smardon, SUNY-ESF	Ecotourism.....	1993

Research Activities of the Archbold Center

Dominica: The USFS Forest Management Demonstration Project now is in its second year. This \$610,000 five-year project supports an active series of workshops and training programs. Project Manager Dr. Ross Wagenseil now is completing installation of a new GIS system on Dominica. We also have just received a \$15,000 grant from the World Wildlife Fund and a \$1,000 grant from the Sophie Danforth Conservation Biology Fund to support the doctoral research of Colmore

Christian, the superintendent of the Dominica National Park Service and a Ph.D. candidate at Clemson.

Costa Rica: The AMISCONDE project now is in the second year of the implementation phase. This \$4 million project is supporting a major watershed restoration initiative in Costa Rica and Panama. We also are in the second year of the USAID sponsored gap analysis/GIS modeling project. We are doing an analysis of the effectiveness of the conservation network in Costa Rica. We have just signed a contract with Colombia University Press to publish the results of this project. We also are pursuing a study of the effect of the pesticides used in banana plantations on wildlife in Costa Rica in collaboration with TIWET.

Panama: Panama is one of the sites of the AMISCONDE project previously mentioned.

Brazil: The director of ATRC has been selected as an outside consultant for several projects in Brazil, most notably the analysis of the national plan for the management of the national park system. This project will begin shortly.

Regional Development Group

This area of research, which is a joint venture between the Strom Thurmond Institute and the College of Forest and Recreation Resources, focuses on regional development, natural resource utilization and natural resource-based economic development. Regional development projects include the following:

An Education Partnership —John de la Howe/Clemson University: In 1987 the John de la Howe School (JDLH) (founded in 1797 by Dr. John de la Howe), and Clemson University entered into an agreement that allows both agencies to synergistically utilize each other's expertise to enhance their students' learning opportunities. Howe-To Industries at JDLH consists of a student cooperative in which JDLH students produce products to sell at the market while others are involved through partial enterprise management and/or ownership. A 1930s era CCC barn has been renovated and was opened April 30, 1993, with the assistance of students from the College of Architecture. It serves as the market place for Howe-To Industries. JDLH students and McCormick area retiree volunteers (from the AARP-Andrus Foundation Volunteer project) are involved in craft production, raising catfish, vegetable gardening, greenhouse work, container and field nursery efforts, and working with livestock, including cattle and horses.

Nature-based Tourism and Rural Coastal Development: During the summer of 1990 the National Coastal Resources Research and Development Institute provided three-year funding for a demonstration project to assess the feasibility of utilizing nature-based tourism enterprises as a rural coastal/regional development strategy. This project is developing a nature-based tourism enterprise model with associated market demand assessment, regional site capabilities and business formation strategies. Project objectives include enhancing the tourism economy of rural Georgetown, Colleton and Beaufort counties by utilizing a mix of marshes, estuarine environs and black-water rivers; combining tourist-based opportunities in these natural areas with designated natural resource preservation goals; slowing coastal land conversion to high density use by providing alternative economic options and strategies for local landowners and residents; developing prototypical guidelines for local citizen involvement in coastal development issues; and developing reports and video materials illustrating coastal nature-based tourism opportunities.

Small Town Development: The institute is actively involved with the S.C. Downtown Development Association, Inc., in assisting with community and economic development for small towns. Both Summerton and Allendale are serving as pilot communities. The institute also has worked with Honea Path, Donalds, Ninety Six, McClellanville and Little River.

The S.C. Crafts Program: The institute has worked with the S.C. Crafts Association to compile a comprehensive listing of craftsmen for South Carolina. This listing will help craftsmen market themselves and their products while helping identify those individuals interested in other institute activities.

In-migration Housing Study: Co-sponsored by Clemson University, the Department of Parks, Recreation and Tourism Management, and the Housing Institute, this study will help identify housing needs and preferences of retirees considering a move to South Carolina. This is the initial phase which will analyze the retirement market segment, assess housing market parameters, and delineate this market segment's contribution to the state's economy. In addition, this study will help clarify the decision-making process that retirees use when choosing where to locate, while concurrently developing market profiles. These profiles will depict the various segments within the retirement housing market.

African-American Traveler Study: In cooperation with the Department of Parks, Recreation and Tourism Management, the institute has initiated a study to profile the traveling public and many states, particularly those in the Southeast, and how they could benefit from this information.

ACADEMIC AFFAIRS

Clemson University Libraries

As a part of the libraries efforts to incorporate strategic planning, improvement of customer relations and continuous improvement, a major effort in the year was the development of library goals, objectives and strategies.

This year was the first full year of the new organizational structure of the libraries, which was developed and implemented at the end of 1991-92. The new structure complements the efforts of continuous improvement and strategic planning. A major change in the structure has been the incorporation of teams. A major success in this area has been the coordinating teams, made up of heads of the various functional units of the libraries. This methodology allows these units to coordinate themselves rather than having an administrative position created and assigned to that coordinating function.

This year's annual report of the libraries is organized around the six major goals of the libraries. Under each goal, reports are made of activities which relate to that goal.

The Libraries will improve existing services and develop new ones.

The Circulation Unit focused its efforts this year on improving the speed and accuracy of basic services. Admirable goals of shelving all library materials within 24 hours, offering page services on a regular basis, continuous pick-up on all floors seven days a week, shelf reading the entire collection three times yearly with an accuracy rate of 99 percent, processing and shelving reserve materials within 48 hours, microforms re-shelved twice daily and shelf read twice yearly, closed reserve materials discharged and re-shelved hourly and straightened and shelf read twice weekly, circulation desk and reserve desk transactions having a success rate

of 99 percent, and open reserves shelf read twice a month. The unit met or exceeded most of these goals and warrants special recognition for this significant improvement in areas directly affecting our customers.

Another improvement for our customers by the Circulation Unit was the addition of Tiger Stripe, which has allowed fines to be collected in a moneyless transaction. This has been well received by students.

The use of the microform collection was very heavy during the year. Hard copies made on the film, fiche and cartridge reader/printers totaled 121,871, a 28.9 percent increase when compared with the previous year. Keeping the machines working and having enough available for the public who needed them was a significant challenge. The continued increasing usage of these materials and requirements for hard copies have demonstrated clearly the need for additional reader/printers.

Public Documents began a regular program of claiming during this fiscal year. A data base was established for keeping track of claims, forms were developed, the Doc Express membership was re-established, and material was ordered as needed.

Both of our new units have been very successful in their initial year. The Records Management Unit made great strides in the area of outreach both to the campus and to the state. The State Budget and Control Board approved electronic schedules for the Department of Administrative Programming Services this year, recognizing Clemson's efforts of leadership in developing methods and guidelines for inventorying and scheduling electronic records for the state. The Records Management Unit began a micrographics project during the year. Its filming is of sufficient quality for the masters to be accepted for storage in the state archives vaults, and they were asked to participate in the State Regrant Project of the State Historical Records Advisory Board and microfilm the records for the town of Winnsboro. These efforts are making the work of the micrographics section more widely known in the state. Being one of the few micrographic facilities in the state and with a growing recognition by local governments for the need to preserve their records, the opportunity for producing revenues exists.

The other new unit created with the reorganization was the Resource Sharing and Copier Services. This unit has responsibility for handling interlibrary loan, document delivery and operating our copier services. This has been a busy year for the unit in all areas. This can best be illustrated by showing some of the activities of the copier services. Almost 1,190,000 copies were produced this year on the coin operated copiers, representing an almost 30 percent increase when compared with the previous year, despite significant downtime for some of the copiers. Income from these copiers was almost \$119,000, with the faculty copiers providing another \$15,000. The addition of Tiger Stripe on two machines during the spring semester reduced the amount of money physically being handled, while not significantly impacting overall revenue. Copier services also instituted procedures to assist the handicapped users who wanted to photocopy.

The Libraries' Reference Unit placed emphasis this year on service first and set its goals accordingly. Significant gains were made by the successful application to become a patents depository and setting up a patent facility in the former ILL area on the main level for this service.

An ongoing evaluation of Reference Unit's services — especially electronic sources of information — led to the substitution of the less expensive Moody's CD on corporate information for the Lotus CD Corporate product and the addition of LEXIS/NEXIS and First Search to the information repertoire. The creation of the Technical and Business Information Center, which was staffed by Ken Murr and several other reference librarians part time, expanded service to another segment of the S.C. community but placed stress on the already tight staffing of Reference, which functioned at short staff for much of the year. The Technical and Business Information Center operated under a grant from EDI and has been designed to provide information services to the business community of the state.

Significant progress was made in subject related library instruction, with the goal of five additional classes being exceeded. Outreach to the community contin-

ued through instruction to 11 school and community groups and tours given to residents of Keowee Key.

Statistics show that overall reference desk transactions increased by 10 percent this year. Fewer people were trained in DIY searching, perhaps indicating that a significant body of researchers already has been trained in previous years. DIY searches remained fairly constant (2,191 in '92-93 vs. 2,150 in '91-92). DORIS searches increased by 13 percent from 54,864 in '91-92 to 62,169 in '92-93.

In the libraries' automation area, the NOTIS installation of a new version of software was a major overhaul of the system. The public catalog changed dramatically in its appearances, with the guide and index screens completely revamped, and a call number index was added.

DORIS was expanded to include the S.C. Job Specifications and became the official point of distribution for the listing of University jobs with the CU Jobs List, which replaced the paper version. Data bases were swapped out, with the Expanded Academic Index replacing the Social Sciences and Humanities Indexes. A major problem with currency of DORIS existed this year, due to a combination of short-staffing at DAPS and a change that the tape vendor, Information Access Co., made to some of its fields which required a new approach to file loading procedures.

The Libraries will identify and provide timely access to available information.

The Cataloging Unit met most of its goals for processing of materials and significantly exceeded many of them. All the purchased material received this year was cataloged, and the backlog of gift materials was reduced by 25 percent. Processing of 1992 theses is current, and contents notes continue to be added to records for the literature collection to improve access to material in collections.

A major emphasis in Public Documents this year was creating greater access to its collections by entering records into NOTIS for federal documents. Their goal of deriving records for all significant monographs into LUDI from the Marcive tapes was delayed by the inaccessibility of the 1992 tapes until March of 1993, but progress is being made. Additionally, the project for adding check-in records for 800 GPO serials had to be scaled back due to the unanticipated complexity of the project, though 170 were added this year. The rest are scheduled for the upcoming year. LUIS records were created, however, for all ready reference and former documents reference titles, all Patent Office titles selected were converted, and 80 percent of the project to derive into LUIS all of the soil survey records in the LUDI file was completed.

Our Resource Sharing and Copier Services Unit achieved an 89 percent success rate in borrowing materials using interlibrary loan with a 10 percent increase in requests and a 47 percent success rate for lending to other libraries. These rates are comparable with or even exceed the performance of similar ILL departments. The turn around time, according to OCLC statistics, has been decreased by two days.

The use of EDDIE, our document delivery service, continued to increase. The delivery rate was 90 percent. An interesting observation is that there now are some faculty members who exclusively use EDDIE for their library materials and no longer set foot in the building.

This past year the majority of the Association of Southeastern Research Libraries agreed to a reciprocal borrowing/lending agreement which provided free ILLs to participating members. The result has been a reduction in the number of invoices we create and pay, saving both on cash outflow and in staff time.

The Libraries will improve and maintain collections to advance Clemson's teaching, research and service goals.

The processing of purchased monographs and serials declined during the past year due to the serials cancellation project and the decreased budget for books. Only \$305,000 was available for monographs, and serials faced a \$100,000 reduction to break even in a year which saw many journal prices rising as much as 75-80 per-

cent. There was a 30 percent drop in the number of firm orders processed and a 3 percent drop in the number of serial issues checked in. The acquisitions staff shifted emphasis to processing other categories of material — especially gifts and the music collection — to improve access to previously inaccessible material. Claiming of materials not received — both first time and especially follow-up — increased dramatically this year as time was available to monitor this activity better.

The Architecture Library continued to improve access to its collections by creating a slide data base and clearing up a major backlog of processing gifts. They reviewed the Planning Documents collection, weeded it, and made plans for improving and updating this resource. This area was identified as needing improvement during a recent accreditation.

Work on the S.C. Textile Research Access Grant proceeded on schedule by the Special Collections Unit, despite the departure of an archivist midway through the year. Approximately 95 percent of the material needing to be filmed has been filmed, and arrangement and preservation of records has continued on schedule.

The Libraries will develop their staff to improve variety and quality of services.

One of the highlights of the staff development year was the Staff Development Day. This was a one-day retreat for the entire staff held at Table Rock State Park. The day included several team building exercises and discussions on improving team building within the libraries.

Other significant achievements included getting the receipt of a teaching improvement award submitted by Lois Sill and the attendance of several of our support staff at a library paraprofessional conference in Florida.

All of the library faculty now have access to Quickmail on the Libraries Local Area Network, and 70 percent of all support staff have access to this electronic mail and document delivery system within the libraries and to several other offices on campus.

We began this year committed to the use of teams as a means of expanding involvement of all levels of staff in the decision making processes of the libraries. We have had some very great successes and some disappointments. In all cases it has been a learning experience for all involved. As noted earlier, some of our greatest team successes came from our coordinating teams. These teams of unit heads, which have done the job of coordinating the activities of several units which have considerable interaction, have demonstrated the advantages of teamwork. Several of the library-wide teams have shown success. A few had some difficult beginnings and began to function well by the end of the year. We unfortunately had one ill-conceived team which it was necessary to eliminate and utilize another approach to the issue.

The Libraries will provide optimal space and facilities for users, staff, services and collections.

Operating in a facility which was designed for a Clemson University some 27 years ago is a challenging one. Not only has the student body and faculty increased dramatically since the building was conceived and constructed — or even since it has been renovated — the types and number of services offered users were unimaginable 20 years ago. Consequently, space is in great demand, not only by users, but also by staff. One of the functions of the facilities team is to examine and make recommendations on a number of alternative ways of improving the space situation of the libraries.

Space needs is not restricted to operations in the Robert Muldrow Cooper Library, it continues to be a problem in the Records Center and Special Collections. With the success of the Records Center's outreach program, more records are being received at the center, with no place to store them. Increased space must be found soon if the Records Center is to be able to meet its future commitments.

Shelving space has been and remains a critical issue in our Special Collections Unit housed in the Strom Thurmond Institute building. The space was built to use compact, mobile shelving and to date, funds have not been available to acquire that type of shelving which will double the existing shelving capacity. Late in the year, however, we were fortunate to receive a donation from the Liberty Corp. and Hipp family in conjunction with the donation of the papers of the Liberty Corp. and Hipp family. This donation will be used, in part, to acquire the new mobile shelving.

The Libraries will increase their funding base from external sources.

The major development success during the year was the receipt of the Liberty Corp./Hipp family donation of papers and funds. The papers consist of more than 100 cubic feet of records relating to the insurance and communication business in the upstate South Carolina via the Liberty Corp. and the members of the Hipp family. Further, \$225,000 was pledged with the papers for their storage and preservation.

The College of Architecture and the Gunnin Architecture Library ventured into development work with their adopt-a-book program which netted \$1,568.25 for new acquisitions. Plans are to continue this program which is a part of the college's homecoming activities.

The past year was the libraries' 100th anniversary. To celebrate, the libraries and the annual giving office of the Clemson University Foundation developed a special fund-raising campaign mailer and sent the mailer to all Clemson donors during 1992-93.

The libraries held their annual book sale. This is an opportunity to sell books which have been donated to the Foundation for use by the libraries. Funds from the sale of these materials are used for the acquisition of new materials.

Library Statistics — 1991-93

Collections	1991-92	1992-93
Cataloged Volumes.....	769,161	797,997
Government Documents	715,967	637,336
Microforms, Pieces.....	218,674	1,715,200
Serial Subscriptions	7,117	6,611
Maps	18,984	19,592
Slides	82,123	84,347
Uses		
Interlibrary Loans Borrowed	8,904	9,799
Interlibrary Loans Loaned	8,703	7,238
Items Circulated.....	310,475	349,839
Services		
Reference Desk Questions.....	66,249	72,914
Telephone Reference.....	1,348	1,409
Liaison Reference.....	4,800	4,910
E-mail Reference.....	32	50
Computer Searches		
Do-It-Yourself.....	2,150	2,191
Reference	59	23

Research	65	49
DORIS	54,864	62,169

Computing and Information Technology

Computer Center

1992-93 saw the computing industry continue its slide into disarray. In the face of industry-wide confusion over technology standards and trends, the Computer Center has proceeded with implementation of the strategic plan for computing developed in 1991-92. Despite the uncertainties regarding the future development of hardware and software, the center remains well-positioned to take advantage of any technological opportunities that may present themselves.

The center has embarked on a major revision of its service offerings with the intent of focusing on the core areas detailed in the strategic plan. The methods of delivering service also have been revised, resulting in the freeing up of resources to enhance service quality and provide additional customer support.

The use of computing resources in academic programs and in the traditional areas of administrative support has continued to increase at a rapid rate. The center has facilitated that increase by providing the necessary hardware and software resources, significantly increasing training services, and working with the University administration to devise a financial strategy that will enable the center to continue to provide the University with computing services of the highest quality into the next century.

Additionally, the center has led a University-wide effort to bring the benefits of information technology into the lives of every single member of the University community. In addition to the promotion of the use of on-line systems for such activities as the processing of leave requests, routing of purchase orders, student registration, and the like, the center has concentrated on encouraging the widespread use of electronic mail and on-line access to a broad array of information data bases.

The e-mail project has been spearheaded by a cross-campus e-mail task force. This group was charged with developing a plan for incorporating the multitude of e-mail systems in use at Clemson into a single, easy-to-use system available to everyone in the University community. The task force canvassed the campus users and determined what was wanted in the ultimate e-mail system. A series of system specifications was developed and passed to an associated technical committee which used those specifications to produce a system design and a timetable for implementation. That plan, a three-phase effort over three years, now has reached the end of phase one. This method of developing system specifications to meet user needs has proven to be so successful that it is being used as the model for future development efforts.

A second major project, again led by a cross-campus task force, has been to provide access over the network to a wide-range of data bases worldwide. The campus network is largely complete, and access to the resources on the network and international networks to which it is connected is relatively straightforward (though some academic departments have difficulty identifying the relatively modest network connection costs), leaving the major problem of how to present the data and where to store it. Widespread use of the Gopher software has enabled users to maintain their own data bases on local computers and make that data easily available over the network to the user community at large. For example, the faculty manual is available online over the network and is maintained by University Relations on a Macintosh computer in the Trustee House. Gopher also permits access to many thousands of data bases (including library catalogs) worldwide.

On the negative side, the rapid increase in the number of on-line systems in use, and the increase in the numbers of people using both new and existing systems resulting from a major emphasis on user training, is putting increasing strain on the available computing resources. While no serious performance problems were con-

sistently felt in 1992-93, that will not be the case in 1993-94. A major concern for center management is how to minimize the problems while the tedious process of acquiring additional resources is gone through.

Administrative Programming Services

Administrative Programming Services (APS) develops and supports information systems for Clemson University. Its mission is to provide support to central administrative units as well as faculty, students and staff members. At present, some 20,000 members of the campus community access information systems supported by APS. These systems span all major functions of the University.

During the past fiscal year the focus of APS activity was to help other units become more productive by developing improved information systems. For example, the electronic forms system originally developed for the purchasing application was expanded to support various electronic personnel action forms, thus eliminating the creation of multi-part forms for manual routing through administrative channels. Also, the University deans and most vice presidents began using the electronic leave form. To support the change from a paper-based campus to a more efficient electronic campus, the customer training group within the Division of Computing and Information Technology began providing training and consultation services for electronic forms.

Continued improvements in services to students were made this year. The on-line course registration system was expanded to allow students to send to departments their scheduling problems and suggestions. Also, a course wait list system was designed for installation in October 1993. A telephone access system for students to receive grades was activated in August 1993. Also, students were given on-line access in 1993 to their accounts for University charges and payments.

APS supported 65 administrative systems in 1992-93. In a typical day, about 600 faculty and staff used on-line systems to conduct University business. Also, several hundred students used the student information system to access academic, placement and financial records. Additionally, use of the on-line library catalog and the periodical indexes increased in 1992-93. Clemson computer users also were given direct access to the library catalog at the University of South Carolina for the first time.

Currently, APS is installing a comprehensive institutional advancement system that significantly improves support for all fund-raising activities. This is the last new system planned for the University mainframe computer. Working with the Administrative Systems Advisory Committee and University administrators, APS has developed a strategy for using new computing platforms and tools to install future administrative and library systems. The first major system to be installed under this approach likely will be a University financial system. Already, several administrative departments have established data bases for general access using the Gopher client/server system. Gopher is the first University-wide client server system used at Clemson. The architecture of Gopher is orienting University departments to the advantages and requirements of the new technologies used in information systems. In general, the technologies support increased desktop computing power supported by well-coordinated data bases and a strong communications network.

Information Systems Development

Information Systems Development (ISD) is a self-supporting unit of the Division of Computing and Information Technology (DCIT). It provides a broad range of information technology services under contract. While it traditionally has obtained the majority of its contracts outside the University, primarily from state agencies, a conscious effort has been made in recent years to broaden the ISD customer base.

ISD's major business continues to be in support of S.C.'s health care agencies. While it is not yet clear what health care reform will mean for ISD, it is certain that

there will be significant changes that will affect ISD's core contracts. This has provided additional impetus for the push toward diversification.

The University's demands for new administrative support systems to improve administrative efficiency in the face of continuing budget cuts have provided new opportunities for ISD. It is, in some cases, more efficient for the University to contract with ISD for systems development than it is to make permanent budgetary allocations for additional programming staff in APS. A number of small contracts also have been obtained with University departments to provide consulting support, network maintenance, and equipment leasing and maintenance. While relatively modest at present, ISD's business with the University is likely to increase to the benefit of both.

ISD's commercial business continues to expand slowly. ISD has contracts with the Clemson University Research Foundation (CURF) to provide R&D services to commercial companies. These contracts provide ISD with revenue for services provided and CURF both with royalties and revenue for services.

While 1992-93 was yet another successful year for ISD, the long-term future of the group became less clear. ISD's vulnerability to political changes was highlighted, emphasizing the urgency of diversification.

The Graduate School

Two new doctoral degree programs were approved by the Commission on Higher Education. They are in educational leadership and industrial/organizational psychology beginning fall 1993 and fall 1994, respectively. Doctoral programs soon will be offered in seven of the nine colleges. Permission also was granted by the commission to offer the existing M.S. degree in civil engineering at the Charleston location on The Citadel campus.

Completed applications for the 1992 fall semester set another record at 5,952, an increase of 4 percent. Forty-two percent of the pool of applicants was accepted, and this value has not varied by two digits in the past seven years. The values to follow for enrolled students represent record highs: total enrollees 4,441 (+8 percent), new enrollees 1,300 (+4 percent), full-time enrollees 2,121 (+12 percent) females 2,084 (+10 percent) and international students 820 (+13 percent). During the '92-93 academic year, 1,098 students received master's degrees, and 98 students were awarded doctoral degrees, representing increases of 15 percent and 5 percent respectively. Again, the economy is a driving force in these increases. This factor will continue but will be countered by decreased assistantship budgets and the implementation of non-resident academic fees for new graduate students effective August 1993.

A process was established to allow applicants to submit application materials directly to the academic departments, with overall monitoring and general admission criterion under the purview of the Graduate School. Twenty of the 68 major fields of study will use this optional process.

The Graduate School was placed administratively under the provost and vice president for academic affairs in August 1992. A national search for a senior vice provost and dean of the Graduate School resulted in the selection of Dr. A. Wayne Bennett in March 1993.

International Programs and Services

Applications for 1993 from international students totaled 3,259; 1,365 were completed and sent on to departments where 752 were accepted. Of these, 662 were accepted for fall 1993; 238 (36 percent) were able to provide adequate financial certification and were issued I-20 or IAP-66 documents. Of this number, a total of 235 new international students registered in 1993 (approximately 120 of these registered in the fall). This 50 percent response rate for fall 1993 of applicants issued I-20 and IAP-66 documents corresponds with arrival rates in the past, but does represent a decline in the total number of new students. Fall enrollments in the previous two

years have totaled 200 or more. The decline in 1993 brings the total number of international students to 753, or a decline of 75 internationals (9 percent) from fall of 1992. A decline in the total number of Indian students by 85 students (22 percent from the 1992 Indian population) accounts for the total decrease. Several factors explain this decline: the increase in the non-resident graduate tuition, financial limitations in India (the largest contributing country), and what appears to be stricter visa controls by the U.S. consulates in India and perhaps other countries.

The fall 1993 international population represents 67 different countries (eight fewer countries than in fall of 1992) and every continent. The top six countries by student population in fall 1993 are India (304 or 40 percent of the total), China (148 or 20 percent), Taiwan (37 or 5 percent), France (35 or 5 percent), Germany (19 or 2.5 percent) and Canada (18 or 2.5 percent).

Sponsored students, students on international scholarships and fellowships, number 25, including 10 Fulbright scholars. Four students are studying here under the International Student Exchange Program, and one is here from University of the Americas, Puebla. In addition to these students, international research scholars number 40.

The Houston Center for the Study of the Black Experience Affecting Higher Education

The center, which now is administratively located under the senior provost and dean of the Graduate School, continues to direct its efforts toward increasing the participation of African American students and faculty in postsecondary education. These efforts focus on research, dissemination, program development and evaluation.

The research activities include the mini-grant program and the participation of research associates from institutions throughout the state. The mini-grant program provided 15 grants of \$1,000 each to researchers representing eight of the state's public and private institutions, who addressed issues related to the center's mission. Fourteen research associates focused on issues such as tracking and testing, minority recruitment, participation of minorities in the sciences, academically talented minority students, curriculum diversity and mentoring.

As a part of its dissemination efforts, the center conducted three seminars, two of which featured the findings of research associates, and the other focused on the work of an international guest of the center. Several research reports were submitted to national data bases for dissemination throughout the nation. In addition, four editions of our newsletter, *Challenge*, were published.

The center continues its involvement in the development of two major projects, one funded by the National Science Foundation and the other by the Department of Energy, that are providing leadership in increasing minority participation in science, mathematics and engineering. At the community level, the center provided technical assistance to Community Advocates for Successful Education of Students. The organization is located in Charleston and is devoted to addressing the educational needs of African American students.

As a result of an extended evaluation study, the center published a final report that documented the graduation rates of African Americans in technically oriented fields from S.C. institutions over the past 10 years.

The National Dropout Prevention Center

Mission

Founded in 1986, the National Dropout Prevention Center (NDPC) has established a national reputation in the area of K-12 dropout prevention and educational reform of our public school system. The NDPC is a partnership of concerned leaders who represent business, educational and policy interests, and Clemson Univer-

sity. It was created to significantly reduce America's dropout rate. The center is committed to meeting the needs of youth in at-risk situations by shaping school environments which ensure that all youth receive the quality of education to which they are entitled. The NDPC has worked to accomplish this mission by providing information services, action research and technical assistance.

Information Services

The NDPC is a national clearinghouse on issues related to dropout prevention, at-risk youth and school reform. As such, the center provides information on a daily basis to thousands of clients each year.

The core of its information services is the FOCUS data base, a nationally accessible computerized data base located on the University mainframe computer. The NDPC collects abstracts and disseminates information through the five files in FOCUS: program profiles, calendar of events, resource materials library, organizations, and consultants and speakers. Users from all over the country benefit from this state-of-the-art resource. In addition, by a special arrangement with New York City Public Schools, the FOCUS data base is provided to them via local access. The FOCUS data base currently is being used as model for the national K-12 Service Learning Clearinghouse data base, a national cooperative in which the NDPC is a significant partner.

The center staff also disseminates information via a quarterly newsletter, periodic research-based monographs, numerous other publications and videotapes. This past year, publications have included *An Evaluation Guide for Tutoring Programs* by Dr. Carol Weatherford of the College of Education and Myriam Seoane, a University graduate student; *The Lifelong Options Program*, a guide to replicating this successful vocational education demonstration project; "The Disadvantages of Tracking and Ability Grouping," one of the *Solutions and Strategies* series, by Dr. Margaree Crosby and Dr. Emma Owens of the College of Education; "Family Literacy's Approach to Dropout Prevention" by national family literacy expert Dr. Sara Currie Mansbach, also in the *Solutions and Strategies* series; a National Dropout Prevention Network directory of network members; and, due to the tremendous demand for this publication, a reprint of the *Service Learning* research report. In addition to their distribution through the National Dropout Prevention Network, approximately 12,000 publications have been sold nationwide this year. In the past year the center also has developed and begun to market two staff development board games for educators: *Nuts and Bolts*, designed to teach the concepts of service learning, and *The Change Game*, designed to assist staff in understanding the process of undertaking change.

In April, the center coordinated the visit of John Hughes of British Petroleum Co., Ltd., coordinator of student tutoring from Imperial College, London, England. Mr. Hughes not only visited local public schools, he also met with Clemson University students who themselves engage in tutoring: students in the College of Education and students involved in tutoring in the PEER Program in the College of Engineering. Mr. Hughes also spoke at the Strom Thurmond Institute about the BP Programme. Our partnership with Mr. Hughes in the area of mentoring and tutoring continues as we work with him in planning an international student tutoring conference to be held in London in 1995.

The NDPC employed six Clemson graduate and undergraduate students over the past year. These students assist the center in the FOCUS data base, special projects, and the publications department. All graduate students are encouraged to work on a publication during their tenure with the center. In addition, a new relationship with the sociology department, begun last summer with a graduate student internship, culminates this fall semester with the NDPC assistant director serving on the student's thesis committee.

The center's work in information services provides a strong foundation for its other activities. These other functions draw upon and enhance the information base of the NDPC.

Action Research

As it has from its inception, the center again has been involved in a variety of action research projects in 1992-93. School sites from across the country are laboratories for program and product development on critical dropout prevention issues. NDPC involvement with the Pine Belt Educational Consortium, Centerville Elementary School, and the final stages of the Lifelong Options Program (LOP) were highlighted this year.

The center has continued involvement in the Pine Belt Regional Service Center (PBRSC) project in Laurel, Miss. Funded through a federal grant in March 1992, the PBRSC serves approximately 125 at-risk students from eight school districts across six counties who need a nontraditional and innovative approach toward completing their education. The center's role in this project is to provide staff development activities and conduct formative evaluation of this unique school setting.

As the third-party evaluator, NDPC has assisted Centerville Elementary in identifying data necessary to establish baseline measures and collection procedures for ongoing evaluation of the project. In addition, center staff have assisted in developing data collection instruments for caseworker reports, surveys of parent perceptions, and measurements of self-esteem in primary grade students.

For three years, the NDPC administered the implementation of the Lifelong Options Program, an enhanced vocational education project, in three sites: Oconee County, S.C., Anne Arundel County, Md., and Broward County, Fla. To conclude this project, a publication entitled *The Lifelong Options Program* was produced by the center, detailing how others could replicate this U.S. Department of Education demonstration project. Nearly 3,000 copies have been disseminated. In addition, a video describing the components of LOP was produced in cooperation with S.C. ETV.

Action research has enabled the NDPC to become a national leader on the cutting edge of successful dropout prevention initiatives.

Technical Assistance

The center provides technical assistance in developing and submitting proposals, planning and implementing staff development activities, program planning and evaluation, establishing mentoring and service learning programs, and broadening collaborative networks. This past year has seen the NDPC working with the National Basketball Association, the National Urban League and Junior Achievement, the National Youth Leadership Council, the S.C. Department of Education, the S.C. Lieutenant Governor's Office, Milliken Corp. and other state businesses, the Virginia Department of Education, the Partnership for Academic and Career Education (PACE) Consortium, the S.C. Higher Education Awareness Program (HEAP), Chattanooga Public Schools, Burson-Marsteller representing McDonald's, and Visions for Youth.

The National Basketball Association's Stay in School program was created in 1989 to address the critical issue of high school dropouts. The program includes several national and local elements designed to deliver the stay in school message to students, particularly those in middle school grades. The program's national elements include a series of televised, public service announcements in which NBA stars encourage students to stay in school; school visits by current and former NBA players and coaches; and a nationally televised special during the NBA All-Star Weekend. NBA legend Bob Lanier, a member of the Basketball Hall of Fame, is the national chairman of the program. Lanier, who has a lifelong commitment to young people, delivers an inspiring and personal message of pride and self-esteem in visits with students across the country. During the 1992-93 season the National Dropout Prevention Center and the NBA forged a unique partnership positioning the center to provide technical consultation to the NBA program. This assistance includes developing educational outreach to students, teachers, and parents; developing public service messages and stay in school celebration telecasts; and completing research and evaluation on the impact of the program. As an additional extension of

this partnership, the NDPC has been designated as the recipient of 50 percent of the funds from the annual jersey auction during the NBA All-Star Weekend.

The NDPC evaluated the first year's effort of the National Urban League/Junior Achievement's Business and Economic Careers Program in Pittsburgh, Pa., and Washington, D.C. The evaluation included a review of the literature on research and best practice; design of interview protocols; on-site visits and interviews in Pittsburgh and Washington; design, printing and mailing of survey instruments for advisers, students and parents; survey analysis; and a written report.

The NDPC now is part of a national cooperative, the K-12 Service Learning Clearinghouse, funded under the Commission for National and Community Service. The center's role is to be the lead regional technical assistance center for the South in meeting the needs of 12 Southern states; partners in this task are the Arkansas Department of Education regionally and the National Youth Leadership Council nationally. In this new role, the center will provide teachers and community workers throughout the South with training and resources in the area of service learning.

During the school year 1992-93, the NDPC played a leadership role in establishing and managing a new, statewide educational initiative: The Lieutenant Governor's Action Council for Youth (LEGACY). This council consists of approximately 25 members representing business, education and government. The first activity of the council was to plan, implement and financially support a three-phased institute, the LEGACY Leadership Institute for S.C. teachers. Fifty teachers, each representing a different school district across the state, gathered for a total of 12 days to receive instruction and training in effective teaching strategies for the at-risk youth population. These teachers, known as LEGACY teacher ambassadors, will serve as trainers within their own schools and districts using these strategies.

The Virginia State Department of Education required each school district in the state to submit in 1992-93 a comprehensive plan for reducing the dropout rate in the district. NDPC provided training to teams from all the districts in the state in strategies for dropout prevention, comprehensive planning and developing mentoring programs. The last in the series was presented October 20-22, 1992.

In partnership with the PACE Consortium, (consisting of Tri-County Technical College, Pendleton, S.C., and seven school districts), one of the nation's leading Tech-Prep programs, center staff have provided both staff development and the development of curriculum materials using integrative learning.

HEAP is a program designed to provide eighth graders in South Carolina information on and motivation toward thinking about higher education alternatives after high school. The NDPC has served in an advisory capacity to the Commission on Higher Education in the development of the media and handouts used for this program, as well as assisting in the planning and presentation of this program to all middle schools in the state.

The NDPC completed the assessment of practices in the Chattanooga Public Schools and presented the report in December 1992, to the Chattanooga Community Foundation and the superintendent of the Chattanooga Public Schools. The foundation used the report to seek additional funding to improve the quality of the district's student support system so that students coming from at-risk circumstances have the opportunity to compete for scholarships provided by the foundation.

The center developed a middle school curriculum for a summer service learning program as a pilot project for Burson-Marsteller, representing McDonald's. The project was implemented this summer under the direction of a Clemson graduate student and was successful both for those students involved and as a first step in the development process for a national McDonald's service learning project.

Center staff provide technical assistance to the county Vision agents and serve on the state council for the Visions for Youth project sponsored by the W.K. Kellogg Foundation.

In addition to these partnerships, the NDPC has contributed substantially to the need for school reform through its work in writing and research (with articles pub-

lished in *Media and Methods*, *Career Magazine*, *Vocational Education Journal*, and *Systemic Change Anthology*). As a solicited evaluator for the U.S. Congress Office of Technology Assessment's report on high-risk behaviors related to substance abuse, the center's impact reached a national scope. Yet even more exciting was the request by the U.S. Department of Education's Office of Educational Research and Improvement (OERI) to prepare a document to guide research and policy in the coming years. The NDPC produced a 37-page *Statement of Research Direction Based on Goal 2*. This paper, one of four commissioned by the OERI, concluded with recommendations for a research agenda that focused on educational practice, changes in the structure of the educational system and policies which encourage flexibility and innovation.

The NDPC hosted its third annual summer institute on the Clemson campus July 11-16, 1993. Thirty-five educators representing 13 states and Canada attended this week-long institute titled, "Revitalizing Education through Active Learning" (The REAL Institute). Sessions were led by national experts and NDPC staff and included topics such as student empowerment, diversity in learning, facilitating change, and practical applications of active learning strategies.

During the past year the NDPC has worked with the College of Education in two areas related to curriculum. First, staff worked with a committee from the college working on the development of a new core component for the doctoral program in educational leadership. The center provided expertise in providing course work for educators to work with at-risk and disadvantaged youth. In addition, our staff worked with Dr. Weatherford on the development and teaching of a summer school course for teachers, "Integrating Service Learning into Curriculums."

The major network with which the NDPC is involved is the National Dropout Prevention Network. This network of some 3,000 members is guided by an executive board of national leaders representing educators; policy makers; community, business and labor groups; parents; and other concerned persons. The NDPC functions as the network's fiscal agent, providing information services and technical assistance to members located in all 50 states and several foreign countries. One of the major joint efforts of this partnership is the national conference held each year in the spring. This past year the National Dropout Prevention Conference was held in Atlanta. Center staff provided two all-day conference presessions, one on Service Learning and the other on Successful Learning: An Integrated System.

Conclusion

The National Dropout Prevention Center has surged to a position where its contributions to education continue to be significant and far reaching. Its agenda for the future builds upon this position of strength, and the center envisions a year of even greater national impact in 1993-94.

South Carolina Energy Research and Development Center

The highlight of the year occurred on September 30, 1992, when Clemson President Max Lennon and Mr. Thomas F. Bechtel, director of the U.S. Department of Energy Morgantown Technology Center, signed the cooperative agreement that designated SCERDC as the coordinating agency for the U.S. Department of Energy's initiative in advanced gas turbine power generating systems. In a report to the Congress, the DOE gives significant credit to the SCERDC/Clemson University for shaping the nation's advanced turbine systems program. The signing ceremony ended two years of background work and initiated an effort that will have SCERDC oversee the research conducted at 60 universities spread across 31 states. The projected contract value is \$37.4 million with a contract life through the year 2000. We are grateful for the trust the DOE has placed in the SCERDC/Clemson University to carry out this task.

The SCERDC/Clemson University also has signed a cooperative agreement with Thermo-Chem/MTCI, a Baltimore, Md., based firm, to be the host site for a large research facility needed to advance new clean coal burning technology — pulsed atmospheric fluidized bed combustion. Facility construction is expected to begin in October 1993. When this facility is completed, it will be one of the most advanced coal combustors in the world and the only facility of this type. Research opportunities in mechanical, chemical, environmental and materials engineering will immediately be available. This PAFBC unit is rated at 50,000 lb/hr of steam. A facility of this size and newness will provide unique education and research opportunities for faculty and students that normally are not available on a university campus. Presently, laboratory scaled cold flow modeling experiments are under way on this \$5.6 million project.

Fiscal year 1992-93 was the most diverse year for technology transfer and outreach opportunities ever experienced at the center. *Energy R&D News* was expanded to include a special edition distributed to the turbine system program. On an annual basis, these two newsletters reach more than 1,500 individuals first hand. The SCERDC also hosted the Symposium on Energy Futures, supported by the regional DOE office in Atlanta, hosted the spring meeting for the S.C. Textile Manufacturers Association and held a mini workshop on residential energy analysis for Duke Power Co. employees. The invited technical seminar series for faculty and graduate students continued with speakers from Exxon and General Electric.

The SCERDC was administratively placed under the Office of the Provost and now reports directly to the senior vice provost and dean of the Graduate School. An internal advisory committee also was established to guide SCERDC activities.

The Strom Thurmond Institute

The Strom Thurmond Institute of Government and Public Affairs is Clemson University's flagship public policy organization. The institute is dedicated to the principle that broad access to knowledge, and a free exchange of ideas will result in more effective government. The institute, therefore, sees as its purpose the promotion of awareness of public policy issues among citizens and the advancement of public sector problem solving throughout the University's teaching, research and public service activities.

The institute accomplishes its mission through four major avenues: its Public Policy and Regional Development Programs, its Public Events and Lecture Series, a cross-disciplinary joint Public Policy Program and a Publications Program. The scope of the Strom Thurmond Institute's programs is national and international, but its focus is on South Carolina. Furthermore, as a public policy and regional development center for a land-grant University, the institute will continue to place emphasis on rural and community development issues in South Carolina.

Public Policy and Regional Development Programs

The Public Policy and Regional Development programs at the institute have involved many areas of domestic and foreign policy. During 1992-93 the major areas of emphasis were decision technologies, economic policy, regional development, and state and local government policy. Other research and public service activities in which the institute has been engaged in the past include energy emergency planning, engineering and technology policy, water policy, comprehensive land-use planning, taxation policy, county needs assessments, econometric modeling and municipal incorporation.

Decision Technologies/Spatial Analysis Laboratory: The Decision Technologies research agenda addresses the role of computer technologies in the decision-making processes associated with environmental policy, natural resource management and community development. The decision tools presently being utilized include remote sensing, geographic information systems (GIS) and the global positioning system

(GPS). Decision Technologies projects include the following:

Wetlands Information Services: This three-year wetlands mapping project started in 1992. The project is funded through NASA's Earth Observation Commercialization Applications Program. Projects in this program typically are joint research ventures between private business and universities. The Strom Thurmond Institute's business partner is Applied Analysis, Inc. (AAI), based in Billerica, Mass. The objective is improving wetlands data through software development and marketing the data base for development planning purposes. The project integrates remote sensing, GIS and GPS for wetlands mapping. It is anticipated that once the procedures are in place for the study area — Beaufort and Jasper counties — AAI will be able to market the process nationally.

A Data Base and Mapping Framework for Assessing the Implications of Climate Change on the Southeastern United States: This project, conducted jointly by the Strom Thurmond Institute and the Department of Planning Studies for the Southeast Regional Climate Center (SERCC), is providing a data base and mapping framework for climate analysis in the Southeastern United States. GIS was used to generate an atlas and data matrix for climate and hydrology stations, producing a land-cover map of the region. This process provides SERCC with a data base that displays either data associated with particular geographic points or geographic points associated with certain data parameters.

Gap Analysis Mapping of Diversity of Biological Resources: This is a two-year project with the Archbold Tropical Research Center of Clemson University and the Regional Wildlife Management Program at Universidad Nacional in Costa Rica. The project tests a conservation mapping model proven in the United States in Costa Rica, and it establishes data requirements for the international application of the model.

Retirement Studies Laboratory: The idea for the lab evolved from ongoing activities involving demographic shifts and policy issues surrounding our aging population. Two projects already have been housed in the lab. The first, the New South Carolinians Study, has been completed and suggested a profile of recent retired immigrants to South Carolina. The second, a project funded by the AARP Andrus Foundation, brings retired residents of McCormick County together with the at-risk youth of the John de la Howe School to share experiences in a mentoring atmosphere to help run Howe-To Industries. The goal of the laboratory is to bring together faculty and staff from across Clemson and throughout the state to examine the social, economic and political implications of retiree migration patterns in South Carolina and throughout the nation. The lab will provide focus and visibility for ongoing activities and provide a mechanism to expand research and information distribution for this important area of policy development.

Economic Policy: In 1992 the institute re-initiated the Economic Outlook Project. This program, directed by Bruce Yandle, former institute director and senior fellow, focuses attention on the national, regional and state economies through a series of Economic Outlook Conferences, regular reports on the economic situation, columns for newspapers and special programs presented to business and civic groups and public sector organizations throughout the country.

Regional Development: This area of research, which is a joint venture between the Strom Thurmond Institute and the College of Forest and Recreation Resources, focuses on regional development, natural resource utilization, and natural resource-based economic development. Regional development projects include the following:

An Educational Partnership — John de la Howe/Clemson University: In 1987 the John de la Howe School (JDLH) (founded in 1797 by Dr. John de la Howe) and Clemson University entered into an agreement that allows both agencies to synergistically utilize each other's expertise to enhance their students' learning opportunities. Howe-To Industries at JDLH consists of a student cooperative in which

JDLH students produce products to sell at the market while others are involved through partial enterprise management and/or ownership. A 1930s era CCC barn has been renovated and was opened April 30, 1993, with the assistance of students from the College of Architecture and serves as the marketplace for Howe-To Industries. JDLH students and McCormick area retiree volunteers (from the AARP-Andrus Foundation volunteer project) are involved in craft production, raising catfish, vegetable gardening, greenhouse work, container and field nursery efforts and working with livestock, including cattle and horses.

Nature-Based Tourism and Rural Coastal Development: During the summer of 1990 the National Coastal Resources Research and Development Institute provided three-year funding for a demonstration project to assess the feasibility of utilizing nature-based tourism enterprises as a rural coastal/regional development strategy. This project is developing a nature-based tourism enterprise model with associated market demand assessment, regional site capabilities and business formation strategies. Project objectives include enhancing the tourism economy of rural Georgetown, Colleton and Beaufort counties by utilizing a mix of marshes, estuarine environments, and black-water rivers; combining tourist-based opportunities in these natural areas with designated natural resource preservation goals; slowing coastal land conversion to high density use by providing alternative economic options and strategies for local landowners and residents; developing prototypical guidelines for local citizen involvement in coastal development issues; and developing reports and video materials illustrating coastal nature-based tourism opportunities.

Small Town Development: The institute is actively involved with the S.C. Downtown Development Association, Inc., in assisting with community and economic development for small towns. Both Summerton and Allendale are serving as pilot communities. The institute also has worked with Honea Path, Donalds, Ninety Six, McClellanville and Little River.

The S.C. Crafts Program: The institute has worked with the S.C. Crafts Association to compile a comprehensive listing of craftsmen for South Carolina. This listing will help craftsmen market themselves and their products while helping identify those individuals interested in other institute activities.

In-migration Housing Study: Co-sponsored by Clemson University, the Department of Parks, Recreation and Tourism Management (PRTM), and the Housing Institute, this study will help identify housing needs and preferences of retirees considering a move to South Carolina. This is the initial phase which will analyze the retirement market segment, assess housing market parameters, and delineate this market segment's contribution to the state's economy. In addition, this study will help clarify the decision-making process that retirees use when choosing where to locate, while concurrently developing market profiles. These profiles will depict the various segments within the retirement housing market.

African American Traveler Study: In cooperation with PRTM, the institute has initiated a study to profile the traveling public in many states, particularly those in the Southeast, and how they could benefit from this information.

Public Events and Lecture Series

The institute features individual lectures, panels, round table discussions, seminars and special presentations on current issues in public policy. The majority of our events are open to students, faculty, staff and the general public at no cost. The institute's Self Auditorium is well equipped and seats 234 people. This year we made improvements in the auditorium lighting and purchased a special effects stage set. In 1993 the institute sponsored or co-sponsored about 45 programs. We are encouraging program cosponsorship which creates a diversified mix of speakers and programs.

Third Thursday at the Thurmond. On the third Thursday of each month during the academic year a program is presented at 7:30 p.m. in the institute auditorium. This year's "Third Thursday" programs were:

- *An Evening With John Muir: Conversation With a Tramp*, Lee Stetson, Wild Productions, Yosemite National Park;
- *How to Find A LULU Site: Where to Put Society's Unwanted Facilities*, Herbert Inhaber, principal scientist, Westinghouse Savannah River Corp.;
- *Follow-Up of the Presidential Election and Legislative Challenges in S.C.*, Lee Bandy, *The State*; Tom Fowler, S.C. ETV; Lois Lovelace Duke, Department of Political Science, Clemson University;
- *Gifford Pinchot: From the Other Side*, Gary Hines, USDA Forest Service;
- *Strom Thurmond and the Politics of Southern Change*, Nadine Cohodas, author; and
- *How Do We Save a Fiddle Tune*, Alan Jabbour, director of the American Folklife Center at the Library of Congress.

Strom Thurmond Seminar in Government and Politics for Social Studies Teachers. 1992-93 was the 11th year in which the institute conducted this seminar in government and politics on an issue of interest to high school and middle school social studies teachers. Twenty teachers are selected on a competitive basis to participate in the seminar. The first week is held on the Clemson campus and consists of lectures and guided discussions on various aspects of the topic for that year by Clemson faculty and invited lecturers. The second week is spent in Washington, D.C., where seminar participants are afforded the opportunity to visit government and private agencies dealing with the issue at hand, spend time on Capitol Hill in discussions with members of Congress, and hear lectures and guided discussions by policy makers and opinion leaders. This year's seminar topic was "The Collapse of the Soviet Empire and the New World Order." The seminar is presented through the cooperation of the Department of Political Science, College of Liberal Arts and the College of Education. The 1993 seminar was funded by the U.S. Institute of Peace.

Harris Page Smith Lecture Series. The fourth annual Harris Page Smith Memorial Lectures on Local Government in South Carolina were held on November 12, 1992. The series was begun by the institute in 1989 to honor the late Sen. Harris Page Smith. The speakers, who are the presidents of the S.C. Association of Counties and the Municipal Association of South Carolina, address the major issues, challenges and opportunities facing county and municipal governments in the state. Speakers this year were Stephen M. Creech, mayor of Sumter and president of the Municipal Association of South Carolina and Belle J. Kennette, Greenwood County Council and president of the S.C. Association of Counties.

Joint Public Policy Programs

Some programs operating under the umbrella of the Strom Thurmond Institute represent joint ventures between the institute and other organizations on campus. This usually means that other colleges or departments contribute resources to the program in the form of funding and/or personnel, and the institute serves as the facilitating agent. Such is the case with two programs currently being operated within the institute: the Community and Economic Development Program and the Environmental Policy Program.

Community and Economic Development: In July 1989 the institute signed an agreement with the Cooperative Extension Service and the S.C. Agricultural Experiment Station to conduct the Community and Economic Development Program for the benefit of rural communities throughout the state. In 1992 this agreement was extended to include the College of Commerce and Industry and the University's Office of Public Affairs. While federal subsidies for local government programs have declined significantly, federal and state mandates regarding solid waste management, hazardous waste treatment, water quality and other issues have increased dramatically. Rural communities have felt the impact of these negative

trends even more. As young people have migrated to the cities, small towns have seen businesses move to the bypasses and the outlet malls, and young professionals such as doctors, lawyers and educators seek their fortunes in larger metropolitan areas.

The importance of the Community and Economic Development Program cannot be overstated. It is one of the vehicles through which Clemson will transform itself into the model land-grant University of the 21st century. By combining the strengths of academic units across the campus, Clemson will broaden its definition of public service to include not just the traditional agricultural and agribusiness sector, but education, research and service throughout all academic disciplines. Through the Community and Economic Development Program, Clemson makes the science, technology and policy research being developed on the campus available to all communities of South Carolina, but particularly to the rural communities that are in need of assistance.

In 1992-93 the Community and Economic Development Program provided advice and consultation to communities, government entities, and elected officials on a wide range of policy issues, including water planning, economic development, solid waste management, consolidation of public services, demographic changes, government restructuring, economic policy and strategic planning. Program faculty also conduct applied policy research on state and local issues.

The program continues to publish a quarterly newsletter, *The Community Leader's Letter*, supported by the Clemson Cooperative Extension Service. It is mailed to more than 16,000 grassroots leaders throughout the state. Articles from this newsletter have been quoted in newspapers across the state and used as background material for decision making.

To help develop thinking on the campus and in the surrounding community about economic development issues, a biweekly series of lunch time economic development workshops is in its second year. Every two weeks a speaker is invited to present remarks on an economic development issue, after which comments and discussion are invited from the attendees.

Environmental Policy Program: One of the four major focal points of Clemson's strategic plan is the environment. In accordance with that plan, the institute established the Environmental Policy Program in 1990. Much already has been done at Clemson in the areas of environmental science, environmental engineering and wildlife and environmental toxicology. To solidify that momentum the Environmental Policy Program will coordinate interdisciplinary policy research and ultimately intends to develop a graduate program emphasis in environmental policy.

Publications

The institute operates a publications program to disseminate the results of its research and public program activities. The institute's mailing list exceeds 18,000 and includes colleges and universities, high school libraries, research institutes, government agencies, private organizations, business corporations and interested individuals throughout the United States and numerous foreign countries. The publications program includes a lecture series, proceedings of conferences and symposia, directories, research and special reports, STI NOTES, and working papers. A video was produced titled, "Nature-Based Tourism: Interviews with Providers." Publications released during 1992-93 include the Harris Page Smith Memorial Lectures; four editions of "The Community Leader's Letter"; three issues of "The Economic Situation," a quarterly report written by Bruce Yandle, senior fellow and alumni professor of legal studies; "South Carolina Craft Artist Directory"; a nature-based tourism report on "Profiling Nature-Based Travelers"; a special report on "Investment Opportunities and Options for Taiwan's Aviation, Shipping and Ship-Building Sectors"; an STI NOTES on "Income Tax Credits From the Production of Gas From Biomass"; and working papers on "New South Carolinian Study: A Profile

of New Movers" and "Domestic Capital Mobility: A Necessary Condition for a Successful Market Economy."

Visiting International Scholars Program

The institute offers a visiting International Scholars Program whereby distinguished foreign scholars are brought to the institute for a semester to conduct research. While they are on campus, these international scholars also are afforded opportunities to share their expertise and perspectives with students through lectures, seminars and classroom instruction.

Foreign scholars from Australia, Colombia, India, Nepal and the Republic of China (Taiwan) have contributed to this research while guests of the institute. During 1992-93 the visiting international scholar was Dr. Soushan Wu, director, Management Science Institute, Taipei, Taiwan, Republic of China. While at the institute, Dr. Wu presented seminars and lectures to Clemson classes.

Undergraduate Studies

The Undergraduate Studies Office is responsible for undergraduate academic programs and curricula, academic standards, scholarships and awards. University-wide lectures, new faculty/staff orientation, summer sessions, the Clemson Career Workshops, the Junior Scholars, the Science and Technology Entrance Program, the Calhoun College honors program, Cooperative Education, special post-graduate scholarship programs and special University ceremonial occasions.

In curricular matters the "general education" component of all undergraduate education is being restudied by faculty committees to ensure that all students are well-prepared to deal with the complex challenges of modern life. This should be in place by May 1995.

The Honors program reached 813 students in 1992-93. Ninety-three students graduated with senior departmental honors in December, May and August. Seven students were awarded National Science Foundation grants between 1991 and 1993. Four major lectures focusing on the encounters of Europeans and Native Americans in the aftermath of the Columbus land fall in 1492 attracted standing room only audiences. The Science and Technology Entrance Program, designed to aid marginal students in agriculture, forestry, textiles and industrial education technology to have meaningful access to Clemson, has enrolled its sixth class. First to second-year retention rates on students who entered in this program are slightly better than those of regular entrants. The first entrants have begun graduating at the rate of 52 percent in five years.

Cooperative Education continues to be a leader in our region. More than 650 students participated this year throughout the United States and Europe in 1,244 successful work assignments in industry, commerce and government.

A number of students from the Governor's School for Science and Mathematics spent the summer in research projects on the campus at Clemson and at University Research and Education Centers located throughout the state. This year, however, saw a significant increase in these students going out of state for college.

The 1993 summer sessions generated more than 45,000 credit hours (a record high), which is slightly more than last year. Clemson's commemoration of the 100th anniversary of the opening of Clemson Agriculture College will bring David Billington, an engineering professor from Princeton, David Buisseret, a cartographer from the Newberry Library, Duane Acker, former president of Kansas State University, and Niles Eldridge, curator of the museum of National History, to the campus as visiting master teachers.

The Clemson Career Workshops continue to be a primary recruiting program for S.C. minority high school students. The University greeted 56 new freshmen recruited by this program to enroll in fall 1993.

The Junior Scholars and Summer Science and Engineering programs bring academically talented students between the ninth and twelfth grades for summer enrich-

ment programs on campus. Now in its ninth year, this program enrolled 597 students in summer 1993.

Undergraduate Admissions, Records and Registration, and Financial Aid

The 1992-93 academic year marked the highest (total) University enrollment, with 17,666 students registered for classes — 14,616 full time and 3,050 part time. This represents an increase of more than 2 percent from last year. Of the total enrollment, 4,361 were graduate students.

The College of Commerce and Industry had the second highest collegiate enrollment with 3,279 students. The College of Engineering was first with 4,128, followed in order by Education (3,121), Sciences (1,905), Liberal Arts (1,838), Agricultural Sciences (1,143), Nursing (745), Architecture (741) and Forest and Recreation Resources (614).

Higher education continued to become increasingly accessible as evidenced by the number of freshmen entering college with advanced standing. In the 1992-93 academic year, new high school graduates entered Clemson with advanced standing by means of College Board Advanced Placement courses (988 students, 5,988 credit hours) and by concurrent enrollment in high school and college or enrollment in summer school (207 students, 1,117 credit hours).

At Clemson, performance in high school has proven to be the best single predictor of success in the freshman year. The class ranks of entering freshmen remained stable, with 36 percent of the class entering in fall 1992 ranked in the top 10 percent of their class, 60 percent in the top 20 percent, and 94 percent in the top 50 percent. The freshman class average Scholastic Achievement Test (SAT) score of 1,037 compared with a national average of 896 reported by the College Board for all high school seniors. Clemson's freshman average of 1,037 also is the highest average among state-supported institutions in South Carolina. Of the 9,940 new applications for admission processed for 1992-93, 6,588 were accepted and 3,282 actually enrolled (freshmen and transfer students).

Clemson students come from all 46 S.C. counties, 47 states, Puerto Rico, the District of Columbia and 75 foreign countries. Residents of South Carolina accounted for 68.6 percent of the 17,666 students. Greenville County continued to have the most students enrolled (1,889). Anderson County was second with 1,208, followed in order by Pickens, Spartanburg, Oconee and Lexington counties. Most out-of-state students came from Georgia (626), New Jersey (401) and North Carolina and Florida (392 each).

Computerized early registration helped students get a smooth start for fall classes. Approximately 85 percent registered early and had their course schedules completed before arrival on campus to begin classes.

The enrollment of women at Clemson reached an all-time high during the 1991 fall semester. There were 7,540, of which 5,693 were undergraduates. Enrollment of undergraduate women increased more than 1 percent from last year, and women continue to constitute approximately 44 percent of the undergraduate enrollment.

The Clemson student body continues to be a working group, receiving a significant amount of financial assistance through loans, grants, scholarships and employment. Clemson awarded 931 long-term federal Perkins loans totaling \$689,200. The University also approved and certified 2,747 federal Family Education Loans with a total value of \$9,583,166 from a variety of lending institutions. Excluding donor-selected scholarships, 2,745 scholarships and grants valued at \$5,377,230 were awarded. The number of students receiving Pell Grants was 2,213, with awards totaling \$3,511,775. In all, about 56 percent of the undergraduate student body received an estimated total of \$29.2 million in financial assistance.

**Fall Semester Enrollment Comparisons for the
Past Twenty Years**

Year	Undergraduate	Graduate and Others	Total
1972-73	7,686	2,071	9,757
1973-74	7,910	2,202	10,112
1974-75	8,171	2,415	10,586
1975-76	8,576	2,785	11,361
1976-77	8,620	2,763	11,383
1977-78	8,708	2,566	11,274
1978-79	8,925	2,553	11,478
1979-80	9,291	2,457	11,748
1980-81	9,427	2,152	11,579
1981-82	9,918	2,008	11,926
1982-83	10,151	1,983	12,134
1983-84	10,217	2,242	12,459
1984-85	10,488	2,438	12,926
1985-86	10,434	2,459	12,893
1986-87	10,360	2,702	13,062
1987-88	10,970	2,895	13,865
1988-89	11,774	3,020	14,794
1989-90	12,563	3,509	16,072
1990-91	13,010	3,293	16,303
1991-92	13,285	4,010	17,295
1992-93	13,305	4,361	17,666

**Number and Percent of
Black Students**

Year	Number	Percent
1972	179	2.00
1973	211	2.00
1974	216	2.00
1975	338	3.00
1976	307	3.00
1977	336	3.00
1978	290	3.00
1979	341	3.00
1980	305	3.00
1981	325	3.00
1982	429	4.00
1983	472	4.00
1984	528	4.00
1985	671	5.00
1986	714	5.47
1987	690	5.00
1988	789	5.30
1989	1,004	6.20
1990	1,075	6.60
1991	1,240	7.20
1992	1,316	7.40

**Average College Board
of Freshmen**

Year	Score
1972	995
1973	982
1974	984
1975	983
1976	996
1977	985
1978	1,000
1979	1,002
1980	1,005
1981	1,007
1982	1,017
1983	1,014
1984	1,012
1985	1,012
1986	1,025
1987	1,028
1988	1,032
1989	1,025
1990	1,035
1991	1,028
1992	1,037

**Student-Faculty Ratio
(Full-Time Equivalent)**

Year	Ratio
1972	14.6:1
1973	16.8:1
1974	17.9:1
1975	18.3:1
1976	17.6:1
1977	16.3:1
1978	15.9:1
1979	16.0:1
1980	15.6:1
1981	16.4:1
1982	16.6:1
1983	17.0:1
1984	16.1:1
1985	15.4:1
1986	16.9:1
1987	18.3:1
1988	18.9:1
1989	19.7:1
1990	19.8:1
1991	21.2:1
1992	22.2:1

**Number in Freshman Class
(New Students)**

Year	Freshmen
1972	1,919
1973	2,034
1974	1,949
1975	1,901
1976	1,861
1977	1,838
1978	2,020
1979	1,998
1980	2,008
1981	2,284
1982	2,321
1983	2,122
1984	2,188
1985	2,259
1986	2,239
1987	2,818
1988	2,885
1989	2,900
1990	2,513
1991	2,461
1992	2,469

**Number of Teachers
(Full-Time Equivalent
Teaching Faculty)**

Year	Teachers
1972	614.9
1973	578.4
1974	591.8
1975	602.5
1976	611.3
1977	654.4
1978	675.6
1979	691.8
1980	718.2
1981	709.7
1982	720.9
1983	713.5
1984	762.5
1985	797.3
1986	731.24
1987	713.93
1988	755.48
1989	769.33
1990	791.31
1991	766.34
1992	752.69

**Number of On-Campus Students
in Summer School**

Year	Number
1972	5,232
1973	6,267
1974	5,997
1975	6,275
1976	6,100
1977	6,301
1978	6,393
1979	6,708
1980	6,858
1981	6,897
1982	7,149
1983	7,442
1984	7,418
1985	8,126
1986	8,562
1987	8,446
1988	8,689
1989	9,039
1990	9,873
1991	10,502
1992	10,556

**Fall Semester 1992 Enrollment by Colleges and Degrees Awarded
December 1991-August 1992**

	Total Enrollment Fall Semester	Degrees					Total
		Associate	Bachelor's	Master's	Specialist	Doctorates	
Agricultural Sciences	1,143	0	99	42	0	18	159
Architecture	741	0	133	70	0	0	203
Commerce and Industry	3,279	0	852	303	0	2	1,157
Education	3,121	0	303	201	8	6	518
Engineering	4,128	0	533	193	0	31	757
Forest and Recreation Resources	614	0	113	20	0	5	138
Liberal Arts	1,838	0	347	40	0	0	387
Nursing	745	0	67	11	0	0	78
Sciences	1,905	0	199	70	0	31	300
Non-Degree	152						
Total	17,666		2,646	950	8	93	3,697

Degrees awarded since 1896 (through August 1992) total 77,899 of which 426 have been associate degrees; 61,452 bachelor's degrees; 14,561 master's degrees; 173 education specialist degrees; and 1,287 doctorates; includes 582 Clemson-Furman MBA degrees awarded May 1972-August 1992.

Water Resources Research Institute (WRRI)

Four research projects were funded during the 1992-93 year. The title and principal investigator (PI) for each are listed below.

"An Ecologic-Water Quality Model of Lake Marion, S.C.: Water Quality and Lake Ecosystem Response to Watershed Changes and Lake Management Alternatives." PI: Dr. Hank McKellar, associate professor, Department of Environmental Health Sciences, University of South Carolina.

"Sediment Contamination in Streams and Rivers." PI: Dr. Kevin J. Farley, associate professor, Environmental Systems Engineering Department, Clemson University.

"Development of Waste Load Allocation and Total Maximum Daily Loads for Point Sources and Nonpoint Sources for Complex Estuarine Flow Conditions: Cooper River and Charleston Harbor, S.C." PI: Dr. Steve McCutcheon, Department of Civil Engineering, Clemson University.

"Irrigation Scheduling to Conserve Water and Reduce Nitrate Leaching From Turfgrass." PIs: Dr. James J. Camberato, assistant professor, Department of Agronomy and Soils, and Dr. S. Bruce Martin, assistant professor, Department of Plant Pathology and Physiology, both of Clemson University.

The research for the last project was conducted at the Pee Dee Research and Education Center in Florence, S.C.

In addition to the above four projects, additional research was conducted by the WRRI on four projects: three-dimensional hydrodynamic modeling of Charleston Harbor; riverine sediment and arsenic transport modeling at an EPA superfund site in New Jersey; riverine sediment transport and dam-break modeling at an EPA superfund site in Montana; and, in conjunction with the Ohio WRRI, development of a technology transfer protocol for the SRS.

DIVISION OF ADMINISTRATION AND SECRETARY OF THE BOARD OF TRUSTEES

The Division of Administration was created August 1, 1985, in conjunction with the secretary of the board of trustees. The fundamental responsibility of this division is to formulate, monitor and coordinate fiscal matters for the Office of the President as well as other areas of University administration. The vice president for administration assists the president in discharging his general administrative and executive functions and represents the president during his absence. The secretary of the board reports directly to the board of trustees. He records all proceedings of the board and its committee meetings, is the custodian of the University seal and all records of the board, and performs other duties as may be assigned by the board of trustees.

The vice president for administration supervises the director of athletics, the director of conference and guest services, the director of human resources and the director of student athletes enrichment program.

The internal auditor is under the cognizance of the secretary of the board of trustees, who, in turn, is responsible to the board of trustees.

A report on each unit of the division follows:

Athletic Department

The 1992-93 academic year was one that had many successes for Clemson on both team and individual levels. Clemson had seven of its athletic teams finish in the top 20, while three Clemson athletes won four national championships.

Clemson had 24 first, second or third-team All-Americans in 1992-93, just three away from the most in Clemson history.

The men's track program led the way with 11 All-Americans, four during the indoor season and seven during the outdoor season. The men's track program produced three national champions during the year: Michael Green (55 meters indoors, 100 meters outdoors) and Wesley Russell (400 meters indoors).

Ten teams advanced to post-season play during the 1992-93 academic year. NCAA post-season team bids were received in women's basketball, women's tennis, golf and baseball.

There were three ACC championship teams in 1992-93, with the men's track program claiming two of those championships. Coach Bob Pollock's outdoor team finished 10th at the NCAA championships, the highest finish ever by the men's outdoor track program. It was the third consecutive year the outdoor team had finished in the top 15. The indoor team was no less of a success, finishing second at the NCAA indoor championships, the highest finish by a Clemson team during the year. The Tigers have won the conference indoor track championship six times since 1987, five consecutively. Pollock was named ACC Coach-of-the-Year for indoor and outdoor track, an honor he has won 10 times at Clemson. Michael Green was named MVP of the ACC outdoor meet.

The Tiger golf team finished fourth at the NCAA championships in Lexington, Ky., while all five of Larry Penley's golfers who competed were named honorable mention All-American or better. Clemson advanced to NCAA play for the 11th straight year, one of only four programs in the nation with that distinction.

The wrestling team, led by rookie Head Coach Gil Sanchez, had its highest finish ever with a number 13 national ranking. Junior Sam Henson defeated Chad Zaputil of Iowa to capture the national championship at the 118 pound weight class. The Tigers had three ACC champions, Sam Henson (118), Troy Bouzakis (126) and Tim Morrissey (177). Gil Sanchez was rewarded for his rookie season, being named the national runner-up for the Rookie Coach-of-the-Year by *Amateur Wrestling News*. He became just the third coach in Clemson history to lead a team to a top 20 finish in his first year at the helm, regardless of sport.

The men's basketball squad made its first post-season appearance since the 1989-90 season, advancing to the second round of the National Invitation Tournament. Clemson also advanced to the second round of the ACC Tournament by defeating 12th-ranked Florida State in the first round. Head Coach Cliff Ellis became winningest coach in Clemson history with a 92-82 win over N.C. State on March 3. He now has 159 wins in his nine years as head coach. For the third time (all under Cliff Ellis) in just 15 years, Clemson had two All-ACC players. Chris Whitney and Sharone Wright both were third team selections, while both also were second-team All-ACC Tournament.

Soccer Head Coach Dr. I.M. Ibrahim won his 350th career game in 1993. The Tigers advanced to the finals of the ACC Tournament. Unranked and unseeded, Clemson upset second-ranked Duke in the first round and N.C. State in the second round before falling to Virginia in the finals.

Baseball claimed Clemson's third ACC championship of the 1992-93 academic year. Coach Bill Wilhelm's team, which only was 11-11 in the ACC regular season, became just the second number-five seed to win the ACC Tournament. In the ACC championship game, graduate student Jeff Morris hit the second home run of his career (both grand slams coming against N.C. State pitcher David Allen) to give the Tigers a come from behind 11-7 victory. Clemson advanced to the NCAA midwest regional as the number-two seed, the sixth consecutive year the Tigers have been a one or two seed in NCAA regional play.

In football the Tigers ranked sixth in the nation in rushing offense with 257.1 yards per game and led the ACC in that category. Clemson also ranked 13th in the nation in rushing defense, allowing 120.1 yards per game. Ken Hatfield's Tigers ranked in the top 25 in The Associated Press poll for the first seven weeks of

the season, running Clemson's school record streak to 50 straight weeks in the AP top 25.

The Tigers defeated 10th-ranked Virginia, 29-28, after trailing 28-0. Stacy Seegars was named a second-team AP All-American, while place-kicker Nelson Welch was a third-team choice.

Women's sports had another solid year in 1992-93, with three teams advancing to post-season play.

The women's basketball team made its sixth consecutive NCAA Tournament appearance. Women's outdoor track had three All-Americans. Kim Graham was an All-American in the 200 meters and the ACC outdoor MVP, winning the 100 meters, 200 meters and anchoring the 4x100 meter relay. She set a conference record for ACC MVPs and titles in a career.

The Clemson Volleyball team finished the year with a 24-9 mark. They set the school record for the longest match winning streak at 15. Robin Kibben, an All-ACC selection, was one of three ACC players to be ranked in hitting percentage, kills per game and blocks per game.

Coach Andy Johnston's lady Tiger tennis team finished the season ranked 12th nationally. That was the highest finish for the ladies since 1986. Johnston was named the ACC Women's Tennis Coach-of-the-Year, while Amy Young, Emma Peetz and Shannon Young were All-ACC selections.

Clemson teams also were a rousing success in the classroom in 1992-93, with a record 122 student athletes making a 3.0 or better. Of those, 28 were named to the dean's list (a 3.5 or better), and 14 were named to the president's list (a perfect 4.0). Among those athletes on the dean's list were NCAA champion Michael Green (3.60) and Cormac Finnerty (3.50), who was an All-American in indoor and outdoor track. Soccer goalie Jaro Zawislan, a second-team All-South selection in soccer, was named a second-team ISAA All-American academic selection. He also won the Clemson University Rand-McNally Prize in Geography.

The Clemson golf team also was well represented on the Clemson Athletic Honor Roll. Bobby Doolittle (3.33), Mark Swygert (3.25) and Nick Goetz (3.00), who were All-Americans and All-ACC selections on the course, performed well in the classroom.

Anthony Knight was Clemson's top all-around student athlete in 1992-93. The hurdler on the 10th-ranked Clemson track team won the ACC's Jim Weaver Award and received an NCAA postgraduate scholarship. A dean's list student most of his career, Knight had a perfect 4.0 GPA in fall 1992. Athletically, Knight was a two-time All-American and was a member of the 1992 Jamaican Olympic team.

Department of Conference and Guest Services

In fiscal year 1992-93 this department:

- Hosted the Educational Testing Service (ETS) Advanced Placement Reading in June for the disciplines of mathematics, computer science, German, government and politics, psychology, biology and physics. There were approximately 850 faculty from every part of the nation who evaluated more than 229,000 student tests. In addition, this activity provided approximately 200 temporary jobs for local school teachers.
- Hosted two specialized training programs in mathematics and computer science. These events, sponsored by ETS and industry, allowed more than 330 faculty to learn the most advanced information in these educational areas.
- Hosted more than 100 conferences at Clemson during summer 1993. This brought 11,600 guests and total gross revenue to the University of \$1,404,000.
- Continued to serve as the meeting center on campus, hosting more than 1,000 events in seven function rooms in the Clemson House.

- Continued to improve the Clemson House facility by replacing the water heating system, painting the entire complex, creating a handicapped student residence hall room, and purchasing new student chairs.
- Finalized a transition to establish clear identity for Conference Services as a campus department. This was done by establishing a new office center on the fifth floor of the Clemson House.
- Was instrumental in the final approval to construct the new Continuing Education/Conference Center. The staff met with state legislatures, developed program concepts and presented the project to the local community for support.
- Met its goal of strengthening its overall financial reserves by doubling current departmental reserves.
- Created a successful employee recognition award system.
- Rewrote the vision and mission statement to reflect the role of this department within the current direction of the University.
- Assumed institutional responsibility for the FY '94-95 United Way Campaign.
- Hosted 13 Elderhostel events bringing more than 350 adults to Clemson for the first time.

Human Resources

The Office of Human Resources coordinates and directs the University's affirmative action efforts and desegregation plan. The department is actively involved in recruiting black faculty, staff and graduate students, mediating grievances based on alleged illegal discrimination, conducting an educational and counseling program for sexual harassment, compiling statistical reports for state and federal agencies, overseeing the University's compliance efforts for the Americans with Disabilities Act, and developing projects to meet the objectives of equal opportunity and desegregation.

For academic year 1992-93, the University had 43 blacks with academic status, including four administrators. This represents a decrease of one black administrator and an increase of five non-administrative faculty. Black nonacademic administrative staff remained at 13. Black graduate students increased from 188 to 191 in 1992.

Internal Auditing

The staff of the Internal Auditing Division consists of eight members: an associate vice president, an audits manager, an EDP audits supervisor, an audits supervisor, an EDP auditor, a staff auditor, a business manager and a half-time administrative specialist. The associate vice president reports administratively to the secretary of the board of trustees and functionally to the audit committee of the board.

The division provides an ongoing, independent audit function for the University as a service to management. Audit parameters include financial, compliance and operational reviews, as well as special requests.

Department of Student Athlete Enrichment Programs

Major accomplishments for 1992-93 include:

Academics

- A total of 235 student athletes made the honor roll which is the most in the history of the academic support programs.

- For spring semester 1993, the football team had a grade point average of 2.37 — the highest in nine years.
- One hundred percent of the AIC (World Instituted Computer Assisted Teaching) participants significantly improved their learning skills, which has enabled them to be competitive in the academic arena. This program is used to diagnose areas of weakness in reading, language, math and writing and provide supplementary instruction to address those deficiencies.
- An in-service tutorial program was instituted for tutors, which has made a great impact in eliminating communication barriers between tutors and student athletes. Students also are bonding more than ever before. This program has improved the overall delivery of service in the area of academic support.

Personal Growth and Development

- We have implemented freshmen programs for student athletes which address subjects such as nutrition, eating disorders, time management, sexually transmitted diseases, academics, careers and many other areas that will enlighten our student athletes and address their personal needs. These programs have been very effective in front-loading freshmen in their transitional period.
- A group of student athletes is participating in the C.U.R.E. organization as peer educators to effectively communicate alcohol and drug problems as well as other satellite topics that could affect academic success.
- A speakers bureau was established for student athletes to speak to elementary, middle and high schools, civic organizations and other groups in the community. The opportunity for student athletes to speak to these groups often changes the public perspective of student athletes.

These engagements allow student athletes to enhance interpersonal skills.

Career Assistance Program

- The jobs program has gotten off to a great start with the implementation of a career suite for potential employers of student athletes during the summer and long-term employment after graduation. This suite is hosted by Bill D'Andrea and Richard Cassidy (a former student athlete) each home football game. This allows potential employers to become familiar with our programs.
- The Student Athletes for Career Advancement organization comprises all student athletes interested in making advancements in their careers. Student athletes interested in meeting employers and discussing job opportunities are invited to the suite on Saturdays during home football games.

BUSINESS AND FINANCE

The Business and Finance Division exists to support the goal of the University vision statement.

Clemson University will become the nation's leading technologically oriented land-grant university. This end will be achieved through an uncompromising passion for excellence in undergraduate and graduate teaching, research and public service. The University will emphasize science, technology and innovation and will be dedicated to providing a

liberal education that fosters integrity, critical thinking, a global view and leadership for a changing world.

Supporting the transformation of this vision into reality will require a business organization built on creativity, innovation and integrity. Creativity and innovation are necessary to devise operational methods with sound internal controls, but which are flexible enough to ensure timely and cost-efficient support services are provided. Organizational and individual integrity will be essential in an environment emphasizing front-line decisions and fiscal responsibility.

Many activities described in this annual report reflect the Business and Finance commitment to reducing administrative costs by simplifying and streamlining processes. The Certification and Departmental Credit Card programs are prime examples of innovative solutions to rising bureaucratic costs. Certification will, in certain instances, reduce the administrative reviews required to complete a process, and the credit card will greatly reduce the number of vouchers submitted for small purchases and the number of checks written. The Career Path program is a creative approach to the problem of employee advancement. Career Paths, when developed and approved, will clearly define the required training and skills necessary for each employee to advance to the next level of their career path. Employees will automatically be promoted unless a vacancy is required at the next level, upon completion of the training and skills requirements.

To promote organizational and individual integrity, Business and Finance developed and adopted an ethics policy. The policy outlines the ethical responsibilities of the organization to the employee and of the employee in business dealings with others, both inside and outside of the University. Organizational integrity is also reflected in the University's internal controls. Business and Finance continuously monitors policies and procedures to ensure adequate internal control.

The *Business and Finance Strategic Plan* identifies five critical areas which transcend divisional and departmental boundaries. These areas — strategic planning, quality and leadership, governmental relations, environment, and internal control — are emphasized as targets for organizational improvement.

Strategic Planning

The Business and Finance commitment to strategic planning was demonstrated by the updating and publishing of the *Business and Finance Strategic Plan*. The plan details long-term (strategic) and short-term (tactical) goals and objectives designed to establish an efficient, service-oriented organization. These goals and objectives are presented for the five areas targeted for organizational improvement and for the functional divisions of Business and Finance.

Business and Finance continues to improve the integration of operational, facility and financial planning. The Campus Master Plan and the University Financial Plan continuously are updated to reflect the goals of the University's Strategic Plan.

Quality and Leadership

Business and Finance has initiated an ambitious program of self-evaluation and non-traditional thinking to change the organization's culture, increase the focus on quality issues, and develop methods of controlling and reducing administrative costs. This effort, the continuous improvement process, is designed to prepare Business and Finance for the dramatic increase in demands which will be made on the organization in the next decade.

The continuous improvement process began in 1989 with the Business Systems Study, a review of the administrative computer systems used by Business and Finance. The study defined the future computing needs for Business and Finance on a strategic level. The accounting and consulting firm of Deloitte & Touche was engaged to define requirements for a new computer system based on the findings of the systems study. In addition to the requirements definition, Deloitte & Touche reviewed the Business and Finance organizational study and recommended improve-

ments for efficiency and cost containment. The review, completed in 1990-91, resulted in significant cost savings and national recognition with a National Association of College and University Business Officers cost-reduction incentive award.

After restructuring to implement the Deloitte & Touche recommendations, Business and Finance began a thorough examination of the policies and procedures used to conduct the business affairs of the University. In February 1991, internal process review teams or task forces were formed to study four critical processes: purchase order/payment, work orders, employment and travel. Additionally, seven cross-functional committees were created to review policy issues for specific business activities including: quality programs, accounting and business standards, facilities, financial planning, investments, human resources, and compliance and cost standards for sponsored programs. Two external teams consisting of nationally recognized leaders in facilities management and food service operations conducted peer reviews of the Facilities Planning and Management Division and the University's dining services.

The seven cross-functional committees comprise a broad cross-section of employees who provide advice to the vice president on various policy issues. The following cross-functional committees currently are operating:

Quality Advisory Committee — Reviews quality initiatives including consultant reports, assessment progress, information technology upgrades, implementation progress of business systems projects, and quality task force recommendations.

Accounting and Business Standards Review and Advisory Committee — Reviews accounting, audit and unrelated business income issues and standards of the University and its related organizations. The committee also reviews audit reports for policy issues and implementation.

Facilities Review and Advisory Committee — Reviews capital project proposals, project progress, architect selection, project managers selection, program statements, committee recommendations, facility financing issues, maintenance impact of new construction, and policies relative to permanent improvements.

Financial Planning Review and Advisory Committee — Develops budget management and financial planning strategies for the University and its related organizations.

Investment Review and Advisory Committee — Develops investment, asset and cash management strategies for the University and its related organizations.

Human Resource Review and Advisory Committee — Develops policies and procedures relative to personnel, safety and environmental health issues.

Compliance and Cost Standards Review and Advisory Committee — Reviews the indirect cost rate costing structure and procedures for implementation of federal and state mandated regulations and compliance certifications for University sponsored program activities.

Fourteen "quality-driven guided experiments" have been initiated by Business and Finance as part of the continuous improvement program. Task forces have been appointed to examine business processes by defining each process, flowcharting the process, identifying improvements, and selecting benchmarks to monitor and evaluate the process. Other task forces have been appointed to evaluate the working environment for employees and to devise new programs to improve that environment. The process review guided experiments are:

Work Order Process — Reviewed the Facilities Maintenance and Operations (FM&O) process of providing repair and renovation services to departments. Jobs were followed from inception in the department to completion by FM&O, including all related accounting entries. Eighteen recommendations were developed to improve the process, and appropriate action has been taken on 15 of the recommendations.

Travel Process — Includes the entire travel-related process from the decision to make a business trip to reimbursement of expenses from the trip. The task force made 12 recommendations for improvements, and 10 of the recommendations have been implemented.

Employment Process — Reviewed the entire employment process from the decision to request a new position through hiring a new employee and putting him/her on the payroll. Employment application process, grievance procedures and employee orientations also were considered. The task force developed 26 recommendations, and action has been taken on 18.

Purchase Order Payment Process — Reviewed the sequence of transactions from the purchase of goods or services through payment to the vendor. Thirty-five recommendations were made by the task force, and 23 have been implemented.

Registration Process — Studied the process of registering students. This project was initiated through a joint effort between Student Affairs and Business and Finance.

Cash Management — Examined issues related to cash management strategies. Specific areas included centralized receiving of all cash, security of cash, the impact of centralized cash receiving on related organizations, and a strategy to maximize interest income for the University. Forty-five recommendations for improvement were made by the task force. Business and Finance currently is considering the implementation of these recommendations.

Travel Management — Reviewed the University's approach to travel planning and controlling travel costs. This task force resulted from a recommendation by the travel process task force. The task force developed recommendations to improve the quality, efficiency and effectiveness of the University's travel process. The recommendations are in the process of being implemented.

Certification Process Design — Designed the framework for a certification process. Certification was recommended by the purchase order payment task force to streamline the document review process. Under the recommended process, departmental personnel receive professional training in a process. Upon successful completion of the training, the department performs the process, with Business and Finance performing only a minimal review. FM&O has been certified for Accounts Payable, and the accounting group for Business Services is in the training phase for accounts payable certification.

Establishing a positive working environment for employees is necessary if the organization's culture is to be refocused for front-line decisions. Guidelines and rules must be clearly stated, and employees must receive extensive training in processes and procedures. Guided experiments designed to have a positive impact on the working environment are:

Business Ethics Guidelines — Developed an ethics statement, created an Ethics Advisory Committee and recommended distributing a memorandum from Vice

President David Larson to all Business and Finance employees outlining his ethics philosophy.

Business Work Rules Guidelines — Reviewed all work rules and standards in Business and Finance, and recommendations were made for the consistent application of the rules and standards.

Career Path Task Forces — Formed three task forces to develop career paths for Business and Finance employees. Career paths will be created for trade workers in Facilities Maintenance and Operations, Business Services' personnel and administrative employees. These career paths will clearly outline the skills and training required for each employee to be promoted to the next level. Career Paths will demystify the promotion process, since employees will know precisely what needs to be done for advancement.

Position specifications and training requirements have been drafted for positions in Facilities Maintenance and Operations and submitted to the Department of Human Resource Management for approval. Once approved, Clemson will be delegated responsibility for administering the Career Path program. Task forces for Business Services and Business and Finance Administration recently have been appointed and have begun designing the frameworks for the Career Paths.

A detailed and flexible training program is essential to the success of the continuous improvement process. Employees will need extensive training to adapt to new computer technology and systems in addition to the needs of the Career Path programs. Numerous training sessions have been developed to improve employee knowledge of processes and procedures. Additional sessions are being presented to support the team building, leadership and decision-making skills required by a quality-oriented organization. Employee enrichment is encouraged through various professional development programs and the apprenticeship and GED/Literacy programs.

Employee recognition programs are an integral part of the quality initiatives for Business and Finance. Employees were recognized for extraordinary performance through formal recognition programs including:

Employee of the Month (non-exempt) — Recognizes both outstanding personnel in a particular month and, when appropriate, the long-term excellent service of employees based on diligence, pride in their work, cooperation within the department, their courteous manner in business dealings, outstanding quantity and quality of work, and initiative shown in promoting improvements in service or cost effectiveness.

Recognition includes both individuals and small groups. Recipients are notified in writing concerning their award with a copy placed in their official personnel file. In addition, each recipient will receive an individual "Employee of the Month" award and his/her name will be imprinted on the "Employee of the Month" plaque on display in the vice president's office. There will be an annual luncheon to recognize award recipients and the annual *Kudos* newsletter detailing all of the individuals or groups receiving recognition during the year.

Merit Award (exempt) — Presented during the fall and spring semesters, these awards recognize effort or service beyond the expected level of performance and include a review of past achievements. The recipients receive a certificate and are recognized at the Business and Finance administrative retreats. Criteria include explanation of performance qualities meriting recommendation for this award, how the employee's performance benefits the organization or the University, initiative shown by the individual, and how the employee works toward achieving the goals of the work group. Recipients are included in the annual luncheon and the *Kudos* newsletter.

Group Awards — Awarded on occasions when recognition of a department or large group of employees is necessary. A departmental plaque will be presented, and the group will be included in the annual luncheon and *Kudos*.

Environment

Environmental issues are a major part of Clemson's future, both academically and operationally. Facilities Planning and Management worked with the Environmental Committee to increase recycling efforts of paper and aluminum can products to comply with Federal Regulations Subtitle D and the state Solid Waste Management Act. Facilities Maintenance and Operations performed air quality studies in Barre Hall, Lehotsky Hall and the Strom Thurmond Institute. The Environmental Committee and individual faculty were consulted on the environmental impact and research potential of the power plant expansion. University officials have worked with faculty, local officials and private business on waste management issues including developing additional landfill space.

The University Bookstore opened a recycling center for white paper, plastic bags and aluminum cans, and the motor pool instituted use of a freon recovery machine. Dining Services enhanced recycling efforts with the installation of a cardboard baler at Harcombe Dining Hall. Approximately 4,500 pounds of cardboard are baled each week. Central Services pursued a recycling program for printer toner cartridges and purchased as many unbleached paper towels instead of bleached paper towels. This resulted in a 45 percent savings to University departments and helped with environmental issues.

Government Relations and Communications

Working with other members of the campus community, Business and Finance personnel helped enhance relationships with a variety of Clemson constituencies. Members of the Business and Finance organization increased efforts to establish and renew contacts with state agencies including the Joint Bond Review Committee, the Commission on Higher Education (CHE), and the Division of General Services. Business and Finance representatives cooperated with other college and university officials in efforts to obtain regulatory relief from the state Legislature. The regulatory relief effort is designed to reduce administrative costs and allow colleges and universities to operate more efficiently.

Business and Finance expanded international contacts to support academic and research initiatives in Dominica, Costa Rica, Indonesia and Europe. Providing adequate support to international programs requires Business and Finance to understand the accounting and financial environments for each project. This understanding involves knowledge of international banking laws and regulations, foreign currency and currency conversions, and language and cultural differences in each country.

Efforts to improve internal communications accelerated with emphasis on salary and compensation issues, budgets, formula funding, and Business and Finance accomplishments. *Kudos*, a newsletter celebrating the achievements of Business and Finance personnel, also was published. The Business and Finance *Strategic Plan* and the *Annual Report* were published, and personnel from Business and Finance contributed to the President's Report.

Revisions to the *Clemson University Fiscal Policies and Procedures Manual*, *Clemson University Budgets and Financial Planning Policies and Procedures Manual*, *Clemson University Personnel Policies and Procedures Manual*, and the *Clemson University Sponsored Programs Policy and Procedure Manual* were distributed to the campus. The *Clemson University Facilities Planning and Management Policies and Procedures Manual* was completed, published and distributed.

Special meetings were held with academic department heads and individual faculty to encourage discussions on a broad range of budget, research and personnel issues.

Internal Control

Accountability is increasingly critical as organizations move to codify appropriate internal controls; this not only is a response to past problems, but also an attempt to provide a more consistent measuring tool. A hierarchical model which contains nine components has been presented by the Committee of Sponsoring Organizations, which includes the AICPA and the IIA. The components are:

- Integrity, Ethical Values and Competence
- Control Environment
- Objectives
- Risk Assessment
- Information Systems
- Control Procedures
- Communication
- Managing Change
- Monitoring

Ethics and competence are the base upon which the other components rest. Monitoring is given as the last, and smallest component, for if all other components are in place, findings in the monitoring phase should be minimal. In applying this model to Clemson's Business and Finance organization, it appears many of the criteria for the components have been addressed. Listed below are the components, criteria and a description of Business and Finance actions, taken or proposed, to meet the criteria.

Component: Integrity, Ethical Values and Competence

Criteria: Integrity and ethical values are practiced at all levels of the organization, and people are competent.

Actions: Business and Finance has issued an ethics policy to promote ethical practices within the division. Written job descriptions and the formation of a training organization, administered through Personnel Management and Development, help ensure the competency of employees.

Component: Control Environment

Criteria: There is an atmosphere conducive to effective control and a control consciousness on the part of its people.

Actions: Standing advisory and review committees and ad hoc task forces exist to provide an environment of control and review for Business and Finance policy and control issues and for addressing campus-wide business policy issues.

Component: Objectives

Criteria: Objectives are established for the entity as a whole and for significant activities. Related implementation strategies and plans are established.

Actions: Business and Finance has created a strategic plan for the division, outlining broad strategic objectives and more specific tasks for accomplishing these objectives.

Component: Risk Assessment

Criteria: Risks related to the achievement of the objectives are identified and analyzed.

Actions: The assigning of risks to the achievement of objectives should be formalized by preparing a related document to the strategic plan. This document would outline the risks and benefits of completing each objective.

Component: Information Systems

Criteria: Information requirements are identified and systems put into place to provide the needed information.

Actions: Business and Finance has a continuing program of study of the administrative information systems. The Business Systems Study (1989) and the Deloitte & Touche Study (1990) provided great insights into the needs for information in Business and Finance. One result of these assessments has been the purchase and implementation of the IMRS reporting software.

This software relies on the existing information system to extract core data and bring it into an environment flexible enough to meet the myriad reporting requirements of Business and Finance units.

Business and Finance is continuing with efforts to facilitate and coordinate a campus-wide administrative software systems implementation initiative.

Component: Control Procedures

Criteria: Control procedures are in place to ensure adherence to policy and address risks related to achievement of objectives.

Actions: Business and Finance is subject to numerous external audits and internal audits, the results of which are reported directly to the audit committee of the board of trustees. Additionally, in-house monitoring by Financial Services will supplement these reviews and provide guidance to other Business and Finance units on control matters.

Component: Communication

Criteria: Relevant messages and information are communicated throughout the entity — down, across and upward in the organization.

Actions: Several Business and Finance units produce newsletters and/or other publications which communicate information about their areas to the division and campus. Additionally, Business and Finance has just completed the major undertaking of reducing policies and procedures to writing for five areas: Sponsored Programs, Personnel, Budgets and Financial Planning, Facilities Planning and Management, and Fiscal Policies and Procedures. This set of manuals should communicate appropriate information to all areas of the campus.

Component: Managing Change

Criteria: Changes affecting the entity's ability to achieve its objectives are identified timely and responded to.

Actions: Seven standing review and advisory committees have been established by Business and Finance to provide oversight and consistency in applying, interpreting and developing policies. The Accounting and Business Standards Review and Advisory Committee is one example of a standing committee. One function of ABSRAC is to review audit recommendations for policy implications, with the objective of applying procedures consistently across Business and Finance units. Additionally, ad hoc task forces are established to study particular processes for identifying needed changes and offering implementation solutions.

Component: Monitoring

Criteria: The functioning of internal controls is monitored, and policies and procedures are modified as needed.

Actions: The Financial Services unit of Business and Finance assists with audit recommendation implementation and performs in-house studies and reviews of internal controls.

As can be seen from this information, the Business and Finance organization is a dynamic one. The actions already taken by Business and Finance have positioned the organization to respond to the challenge of having a well-controlled organization, both now and in the future. By focusing on these control premises, the organization has established an excellent basis for controlled processes which will allow it to respond appropriately to increasing growth and change in the second century.

State Appropriations — Formula

An issue that now is familiar to most individuals associated with higher education in South Carolina pertains to the \$30 million in non-recurring money that was part of the FY '92-93 allocation. The FY '93-94 budget approved by the Legislature removes \$26 million of the \$30 million from last fiscal year. The \$4 million that remains in the appropriation is treated as non-recurring. A provision in the FY '93-94 budget allocates any surplus funds from FY '92-93 to higher education after the state's reserve fund is replenished and after an allocation is made to the tuition and grant program. According to the most recent budget and revenue projections for FY '92-93, there will be non-recurring surplus funds sufficient to replenish a portion of the \$26 million that was originally pulled from higher education.

In building its budget for FY '93-94, Clemson University, in consultation with other state agency officials, plans for an additional \$15 million to be allocated to higher education from the FY '92-93 surplus funds. This scenario would result in the replenishment of \$19 million of the \$30 million in non-recurring revenue. This is a reasonable estimate and allows the University to plan its budget with a lower fee increase and smaller budget cuts. In the unlikely event that this surplus does not materialize, the University is taking precautions to meet the shortfall through additional internal reductions.

Even assuming the allocation of these surplus funds, funding for Clemson University in FY '93-94 will fall short of the CHE full-formula funding by more than \$44.7 million. Full formula funding would have yielded \$121.8 million in state appropriations; however, the University will receive only \$77.1 million, excluding separate allocations for increases in base pay and related fringe benefits. The inequities resulting from several years of deviation from the established formula distribution methodology continue. Clemson is funded at 63.29 percent of formula, while higher education as a whole is funded at 65.47 percent. An equitable distribution of formula funding at 65.47 percent would have increased Clemson's appropriation by \$ 2.7 million.

Several formula changes resulted in a lower growth rate in formula funding needs in higher education for FY '93-94. Despite the rule changes, Clemson's funding needs as defined by the formula increased by \$5 million. However, estimated FY '93-94 formula appropriations to the University are \$1.3 million less than actual formula funding for FY '92-93.

Factoring in state budget cuts during FY '92-93 reveals an even larger decline in funding. Clemson's FY '92-93 total E&G state appropriations (includes separate compensation and other allocations) were equal to \$82.1 million. During FY '92-93 state budget cuts significantly reduced the University's budget. The University's estimated total E&G appropriations for FY '93-94 are equal to \$78.3 million, a full \$3.8 million less than initial total appropriations in FY '92-93. This demonstrates the continuing decline of state funding to higher education while state revenues are actually growing, although at a sluggish rate.

The continuation of this inadequate funding only exacerbates existing burdens in S.C.'s higher education community, particularly Clemson University. The burden of pursuing excellence in this environment of inadequate resources unfortunately falls on the students, faculty, staff and patrons of the University. These invaluable and dedicated groups of people continue to pursue the University's vision despite major impediments created by inadequate funding.

Budget Office

- University operating budgets were prepared reflecting the allocation of resources approved by the board of trustees.
- The budget model continued to be refined, providing an increased level of confidence in the accuracy of the source and application of funds allocations and providing a timely post-audit of budgetary activity.
- Continued the refinement of the enrollment model as the primary tool for accurately forecasting the financial impact of enrollment management decisions such as freshman class size and new transfer student academic requirements.
- Annual budget requests were prepared and submitted to the state. This included estimating revenues and expenditures of funds by program and budget categories, projecting FTE positions, reconciling budgets to appropriations and working with the state budget division to simplify the annual budget request process.
- During the year, meetings and written correspondence were provided to the campus to assure strong communications on budgetary issues. Included in these meetings were faculty leaders, student representatives, academic administrative leaders, staff representatives and budget personnel.
- Combined the budget analysis report containing analyses of Clemson's budget for the campus constituency with the budget document containing technical detailed analyses. This was done as a cost-saving measure and also to have a single point of reference documenting the new year's budget.
- The budget office continued to use "pro-forma" formula calculations to determine the impact of various higher education funding levels from the Legislature on Clemson.
- Served on committees and initiated meetings with campus units as preventative measure for units likely to experience budgetary problems.
- Continued refinement of the budget office year-end closing analysis using a PC data base application to drive the performance credit incentive program.

Financial Planning

- Completed the first Clemson University Financial Plan which included historical data and financial projections through fiscal year 1997-98.
- Assisted in the maintenance and revision of the University's enrollment model.
- Determined the financial impact on the University of varying enrollment scenarios through fiscal year 1997-98.
- Conducted numerous financial impact analyses of proposed and actual internal and external policy changes. These included analysis of issues such as the new academic probation policy and the graduate student non-resident fee differential policy.
- Prepared quarterly budget updates for the University board of trustees.
- Regularly monitored the collection of indirect cost revenues to determine current year budget implications.
- Developed a model for projecting future indirect cost revenue collections.
- Coordinated and facilitated data submission to the CHE for state formula funding of Clemson.
- Conducted regular financial impact analyses of proposed and actual CHE formula and policy changes.
- Served on numerous University committees including: the Mid-Year Check Implementation Committee, Facilities Advisory Committee, Investment and Debt Management Committee, Financial Planning Committee and the Privatization Committee.

- Assisted the budget office with the budget document that provided executive summaries of the budget processes and detailed explanations of the revenues and expenditures on the source and application of funds statement.
- Assisted in the budget process by preparing schedules reflecting the distribution of the research and public service matching dollars to each budget center.
- Served as budget liaison to Agricultural Sciences, Student Affairs, and Forestry and Recreation Resources.

Accounting

Improving processes with a service orientation continues to be our goal in the accounting areas. We have focused our efforts on improving or streamlining processes while maintaining the essential accountability checks and balances.

- **Accounting Principles** — Accounting has been actively involved in the debate and offered comments on proposed changes by the Financial Accounting Standards Board, the Governmental Accounting Standards Board and the American Institute of CPAs. We also have participated in group discussions on financial accounting and auditing issues through our professional organizations.
- **IRS Issues** — We have been actively involved in the IRS proposed audit guidelines for colleges and universities. We participated in the debate and offered comments through the National Association of College and University Business Officers. We also have performed an internal review to identify areas for concern and improvement.
- **Financial Systems** — We have continued to document, evaluate and supplement the departmental needs for management information. The PC-based reporting software has been expanded to provide summary management information to the vice presidential areas and the auxiliary business units.
- **Accountability** — We have focused on recommendations made by the auditors. Substantial improvements have been made in the plant funds and fixed asset accounting areas. Improved processes have been implemented to track federal surplus equipment. A year-long effort has been completed to review and formally document costing and allocation issues.
- **Communication** — A substantial effort has been spent in documenting and communicating the regulatory processes. An emphasis has been placed on communicating and improving understanding through training and revised policy statements.
- **Enhancements** — Accounting has been directly involved in evaluating and streamlining processes necessary to support unique research efforts at Clemson.
- **Efficiency Moves** — Efficiency has been improved through additional cross training and prioritizing essential processes.

Managerial Accounting

Indirect cost rates were negotiated with the federal Department of Health and Human Services through FY '94-95. Policies on the distribution of indirect cost, the allocation of card access costs, and the allocation of business services costs were drafted. A functional space survey was performed for the College of Engineering and the director of managerial accounting served as the assistant treasurer for the Clemson University Research Foundation.

The director of managerial accounting served on the following committees;

Intellectual Property
Administrative Career Path
Accounting and Business Standards

Business Affairs

Non-Student Receivables

University receivables has successfully implemented the American Express procurement card program with 29 cards issued and 20 cards pending. Approximately 27 departments are using the card, processing about \$8,000 of transactions per month. Collections for non-enrolled and non-student receivables exceeded \$103,000 and recovered \$40,000 through collection costs and fees, becoming the first year to generate full budgeted revenues. Through the utilities task force, the utilities billing process has become more efficient and cost effective. The costs of utilities are included in a department's initial budget, therefore eliminating the need for quarterly billings.

Cash Management

A University-wide cash management initiative began in late FY '92-93. The first step in this process was to centralize the movement and accounting of cash between the state treasurer and University bank accounts. In addition, a system was put into place to enable daily distribution of revenues to interest-bearing accounts, therefore maximizing investment income potential. Several auxiliary units have been segregated into separate financial entities on our accounting system, allowing for individually discrete financial statements. Cash balances for these units now can be tracked on our accounting system.

Accounts Payable

The design phase of the automated travel prepayment and reimbursement system was started, clearing the way for University-wide access to an automated system. The design provides easy to use access and flexible management reporting. Tax related initiatives resulted in a \$28,000 tax refund for R&D equipment purchases and an accommodations tax exemption for \$1,000. Campus-wide training continued and resulted in two additional departments being certified for voucher processing. Several software packages were researched as part of an ongoing effort to automate manual processes. Payments to individuals and utilities have been specialized and are now performed by one individual. The specialization process ensures consistent and efficient service, which continues to be a goal for the accounts payable department. Relocation expense information was transferred to payroll, which resulted in the elimination of an additional W-2 form. Vouchers for reoccurring vendors were combined and paid weekly to create efficiency, which resulted in savings of time, postage and check processing.

Card Access

Customer service, through the Tiger Stripe program, continued to be the main focus of the card access system. In particular, campus access expanded into many areas, resulting in direct benefits to the student body and other University community members. New access to Tiger Stripe includes:

- All campus washers and dryers.
- Purchase of football and basketball tickets.
- Donations for fund-raising events by student organizations.
- Copy machines in the University library.
- Payment of library fines and other charges.

In addition, Tiger Stripe incorporated new "swipe" technology for vending machines, allowing for faster transaction processing. The card access office was remodeled, resulting in more efficient operations and student services. Concentration

was placed into working with the Student Government Association and the Clemson Chamber of Commerce to give students the capability to make off-campus purchases with a system similar to Tiger Stripe.

Bursar's Area

Implemented an electronic approval system for credit card payments. The new system enables tellers to instantly gain approval or denial of credit card payments, reducing the need for after the fact collection of denied credit card payments. The bursar's office provided technical support for other University departments implementing the electronic approval system. Processing of daily cash reports, returned checks, refunds and receipt corrections was automated through a PC-based system. A substantial increase in financial aid recipients was experienced due to changes in federal regulations from the Reauthorization Act. Bursar banking hours of operation were restructured to provide more focused customer service. All tellers on duty now are serving customers during operating hours, when in the past, tellers were balancing the day's activities and serving customers simultaneously. Fewer students need to attend a formal registration due to more flexible indebtedness guidelines which prevent a student from automatic registration. The bursar's area continues to provide registration support for a growing number of students from off-campus programs. Elimination of costly forms and improved student service resulted from streamlining the graduate assistant payroll deduction process. Billing fees and collection costs for past due student accounts, including deferred financial aid, were assessed as an incentive for timely payment of debts. A conversion to an alternate billing agent for 3,100 student loans was started during summer 1993. Improvements to registration procedures were changed once again to combine the process of fee assessment and payment into one location, providing better service to students. Utilization of other Business and Finance staff during registration, instead of hiring part-time employees, realized a cost savings.

Business Affairs

The Division of Business Affairs comprises accounts payable, non-student accounts receivable, student receivables, cashiers, cash management and campus card access system. The division is charged with the responsibility of ascertaining compliance and accountability in student fees, disbursements, bad debt collection, administration of cash and campus identification consisting of financial and privilege transactions.

Sponsored Programs Accounting and Administration

As Clemson University reaches to new heights in research, the Office of Sponsored Programs Accounting and Administration has the tremendous task, in addition to managing projects, to train support personnel. This past year we have planned and conducted several workshops. In September a workshop will be offered to compliance monitors from the various offices on campus. Compliance is one of the major areas of concern to universities throughout the nation, and special emphasis is being placed on areas such as safety, human subjects, OSHA, audits and drug-free workplace.

The Cooperative Extension Service has focused on external funding as a necessary function for land-grant institutions to move into the next century. We have identified the need for training in sponsored programs management, not only in campus departments, but throughout the state in county Extension offices. Therefore, in addition to compliance training, we will participate in training programs in grants management for county Extension personnel. Hopefully, the training of personnel will assist in the transition from agricultural programs to a vast array of programs to aid farmers, as well as other citizens in South Carolina.

Sponsored programs of the 90s have focused on teaming, consortium and cooperative agreements between federal, state and private entities. Along with the increase in these types of agreements comes more audit requirements and complexi-

ties. As requested by the state auditors, a subcontracting monitoring system will be developed. This system will provide the sponsor and the University with the information needed to ensure all program guidelines are being met by subrecipients.

In coordination with Administrative Programming Services personnel, an executive management program has been developed through the intellect data base software. Deans, department heads and University administrators now can retrieve vital information on sponsored programs in real-time availability. This program also allows user-specific reports to be developed by managers to stay abreast of departmental sponsored program activities.

Fiscal Affairs

Capital Financing

The Office of Capital Financing manages the University's long-term capital financing program and financial information system for all University capital projects.

Major accomplishments of this office for 1992-93 included:

- Finalized the following lease/purchase agreements requiring extensive contact and coordination with lessor, state treasurer's office, and in some cases, an escrow agent:
 - \$57,221 for a new front end loader for FM&O.
 - \$60,000 for new bowling equipment for the University Union.
 - \$84,422 for biomedical research equipment for the Biological Sciences Department.
- Initiated procedures for obtaining financing for the following:
 - Approximately \$35,000 for new computer equipment for Student Affairs .
 - Approximately \$75,000 to finance a portion of the purchase price of a new gas chromatograph/mass spectrometer for the Chemistry Department.
 - Approximately \$125,000 to finance a portion of the purchase price of a new fire truck.

Finance and Investment

This area supports the University through endowment and investment analysis, financial reporting and maintains relations with the state treasurer's office, brokers and banks. Major accomplishments of this office for 1992-93 included:

- Recommended activating the Maj. Rudolf Anderson, Jr., Scholarship Fund which would provide approximately \$38,500 for scholarship purposes.
- Provided financial information for EARTH project endowment totaling \$74 million as of 6/30/93.

Purchasing

Purchasing and Supply Services supports the entire University in the procurement of goods and services, information technology and consultant services. Major accomplishments for this office in 1992-93 included:

- Presented two procurement code training seminars for University employees.
- Issued approximately 885 bids and processed 5,381 purchase orders at a value of \$37.5 million.
- Established various agency contracts to allow volume buying and reduce processing time.
- University Receiving processed 67,426 incoming shipments.

- Purchasing Division administered for Surplus Property three sealed bid sales yielding \$6,947.84.
- Implemented on-line purchase order amendments in May 1992 and processed all amendments for 1992-93 electronically.
- Continued education of our personnel — one buyer, Pam Hassan, was certified as Professional Public Buyer by the National Institute of Government Purchasing. Another buyer, Deneen Wright, has completed all the courses and the examination for certification and will be certified upon completion of four years of purchasing experience, which will be in March 1994. Another buyer, Harold Harris, continues with the required course work. All Purchasing personnel completed E-Main training, 10 completed DOS and Windows courses, and five completed a course on Word Perfect 5.1.
- Established new Information Technology Agency contracts which allow for volume procurements at a higher discount as well as increased levels of service to users.
- Completed and received approval of the Information Technology Plan for 1993-94.

Risk Management and Safety

The Office of Risk Management and Safety provides services in the area of property and liability insurance, loss control, environmental health and safety, and workers' compensation. In 1992-93 the major accomplishments for this office included:

- Purchased accident and illness insurance for 14,249 academic summer camps and processed 210 claims on this policy.
- Implemented the Workers' Compensation Light Duty Program for injured employees.
- Conducted workers' compensation training for departments with high accident rate.
- Served as chair of the Accident Review Board; reviewed 49 automobile accidents, screened drivers' licenses for all University employees and provided defensive driving classes for 377 participants.
- Purchased and maintained insurance policies on University property and liability and related organizations with premiums in excess of \$1 million.
- Processed 476 claims for workers' compensation, automobile liability, tort liability, fire insurance, data processing, comprehensive and collision, and inland marine insurance.
- Reviewed 238 contracts for compliance with University insurance requirements.
- Participated in the Governor's Safe Driver Award program by presenting 75 awards to University employees.
- Served as chair of a committee to study and establish a University medical surveillance office.
- Conducted van and oversized vehicle training class for 28 employees.
- Developed a departmental evaluation/abatement form to train department supervisors to identify unsafe conditions and practices; the form utilizes engineering controls, administrative measures and recommends personal protective equipment to correct them.
- Presented a seminar entitled "Basic Safety: How the Implementation of a Basic Safety System Could Impact a Company's Bottom Line," at the annual S.C. Occupational Safety and Health Conference at Myrtle Beach, S.C..
- Assisted FM&O custodial services in reducing its accidents by 39 percent from the previous year.
- Completed a 40-hour Haz Mat Emergency Response School conducted by Safety Systems, Inc.

- Completely revised confined space safety and health program permit required to include safety and health awareness training.
- Shipped a total of 61,685 pounds of chemical waste from the University and disposed of it at a cost of \$248,230 in 1992-93. Major clean-up operations were performed at Edisto REC and Pee Dee REC. Since then, the Edisto REC has been found in compliance with all applicable hazardous waste regulations by S.C. DHEC. Efforts to correct main campus violations continue.
- Identified the causes of sporadic episodes of air contamination in Jordan Hall ground floor as a worn vacuum system pump and an improperly located makeup air intake. The pump has been replaced and \$95,000 allocated to extend the air intake to a satisfactory location.
- Approached completion of an air quality project to clean and apply anti-microbial coatings to the Plant and Animal Science Building HVAC and related surfaces. A fume hood renovation project is under way to resolve air contamination from chemical activities in this facility.
- Discovered and corrected Legionella contamination of the Barre Hall hot water supply. Other facilities with similar systems have been checked and found to be free of Legionella bacteria, or at concentrations below an action level. A program of periodic monitoring has been established to assure control of this potential problem.
- Conducted air quality inspection and microbial sampling in Barre Hall, Lehotsky Hall and the Strom Thurmond Center. Decontamination activities to improve air quality in the Barre and Thurmond facilities will be contingent upon completion of a scheduled roof replacement at Barre and a water-proofing project at the Thurmond building.
- Reported concerns about unsatisfactory fume hood performance in Jordan Hall; planned a study to be conducted by consulting engineers. Any recommended correction efforts may be combined with roof replacement on this facility.
- Conducted National Pollutant Discharge Elimination System storm water pollution studies, with planning and correction efforts on schedule, assuring current compliance with these regulatory requirements.
- Worked with Architectural Engineering Services to insure timely construction of the new Radiation Protection Facility. Recommended changes in sewage handling equipment resulting in approximately \$12,000 savings in building cost. Construction of the Radiation Protection Facility should begin by mid to late October with completion expected by February 1994.
- Responded to several spills of radioactive source material in research labs. Successful decontamination efforts were provided at no cost to the departments.
- Purchased calibration sources and equipment to provide on-site calibration of radiation detection instruments. Formal calibration procedures were submitted to S.C. DHEC, detailing precise methods to be used in the performance of instrument calibration. Calibration services have been provided to researchers for several months now. This service has resulted in substantial savings to the departments. This expenditure of approximately \$6,000 already has been recouped in savings to the University and promises to repay the original cost many times over.
- Completed and distributed a Radiation Protection and Waste Management Manual to the licensees. The manual has proven to be an excellent training text and has aided greatly in the standardization of practices and procedures used in handling and use of radioactive materials.
- Began management of the collection and disposal of biohazardous waste. In the past, biological wastes have been disposed of in the sanitary landfill. Recent closure of the Pendleton landfill and prohibition of biohazardous waste in our current landfill have dictated that new solutions be employed to

manage this waste. Some solutions such as incineration, autoclaving and shredding are being studied. A standard operating procedure is being written to standardize treatment and disposal of biohazardous waste and to insure continuity across campus in the handling of this material.

- Worked to facilitate the opening of an Occupational Health Office. This is an important step in meeting National Institutes of Health and OSHA regulatory commitments requiring medical surveillance of certain classes of personnel. Some services already are being provided, and the office should be operational within six months.
- Worked with the Institutional Biosafety Committee in the review for approval of research and teaching protocols utilizing biohazardous material (human blood or tissue, hazardous chemicals, and recombinant DNA molecules).

Business Services

Business Services operates University business activities including: dining services, agricultural product sales, information support services, convenience stores, vending, laundry services, bookstore, copy centers, postal services, telecommunication services, central services, and transportation services. These activities are known collectively as Tiger, Inc., an expression used by the vice president for business and finance to convey the spirit of entrepreneurship displayed by Business Services. Currently, no Business Services department is incorporated.

Clemson University President Max Lennon, Student Body President Jason Elliot, and Vice President for Student Affairs Almeda Jacks attended the ribbon cutting ceremony for the grand opening of the new Fernow Street Cafe. The cafe is a 173 seat dining facility featuring a Pizza Hut Express franchise, deli sandwiches and a grill. The canteen also was renovated to allow installation of a Chick-Fil-A franchise. Chick-Fil-A founder Truett Cathey was on campus to participate in the grand opening. These franchises joined Taco Bell and Li'l Dino as brand name services available to students. The deli counter was redesigned at the canteen to include a self-service bakery box and to expand the ice cream service counter. A grand opening also was held for the renovated and expanded Central Stores. The renovation transformed Central Stores into an operation capable of handling walk-in customers in a retail shopping environment in addition to the previously offered mail order and delivery services. The renovation included the design and installation of a canvas awning with the Central Stores logo over the showroom entrance. The awning at the East Campus Convenience Store was expanded to cover the Taco Bell kiosk.

The complete renovation of Harcombe Dining Hall was initiated, with serving lines being relocated and new signage installed to guide customers during the renovation. Painting, wallpapering and additional lighting in the salad bar area of the Clemson House Dining Room were completed, and a new charbroiler was installed. The sheep barn exterior was renovated to allow outdoor sales of University-grown vegetables. Outside seating was provided at both the East Campus Convenience Store, the sheep barn and the Fernow Street Cafe. The University laundry remodeled the customer service counter, installed new front doors covered by an awning at the Dillard Building, and improved dryer venting in the dormitory laundry facilities. An evaporative cooling system also was installed in the Dillard Building to relieve the problem of heat stress on the employees in the laundry plant. The card access office was redecorated with Clemson memorabilia from the bookstore. The Union Copy Center was redesigned to better utilize space to provide improved service as the operation grows. The Telecommunications Office completed the presentation center at the Clemson House for meetings requiring advanced technological support.

The Telecommunications Steering Committee approved and adopted a longrange plan for the premises distribution system. Implementation of the various steps of

the plan will depend on the availability of adequate funding. Space has been acquired in the basement of Strode Tower to serve as a centralized wiring hub for the campus. Fiber optic cabling has been installed between the Southern Bell Central Office and Strode Tower, and between Strode Tower and the Poole Agricultural Center. An agreement was negotiated with Southern Bell to install additional fiber optic cable between Strode Tower and subtending wiring centers in Brackett Hall and one of the new residence halls adjacent to Johnstone Hall.

A major effort resulted in new signage for many of the Business Service operations. New neon signage was added at the canteen and agricultural product sales. Agricultural product sales also added new signs at the entrance to each parking lot, a new sand-blasted wood sign at the front door and a lighted sign on the canopy at the front door. The dining halls began displaying nutritional information on all menu items through display centers or cards affixed to the serving lines. Central Stores installed custom-made signs over each showroom counter to assist customers in locating merchandise.

Business Services placed a special emphasis on the introduction of new products and services during the past year. In addition to the Pizza Hut and Chick-Fil-A offerings, new products included: Agricultural Product Sales added sugar cones, malted milkshakes and four new ice cream flavors; Dining Services sponsored special theme dinners and monotony breakers including Devour the Dog, Thanksgiving dinner, Christmas dinner, Mardis Gras night, international night, carnival night, make-your-own nachos and sundaes, strawberry shortcake, cheese board, monthly birthday cake, back-to-school, soup bar, Valentine's Day, Halloween and midnight breakfast. Board plan menus were revised to include 25 percent more new items, and events were held for board plan members only in an effort to promote the advantages of board plans instead of Tiger Stripe or cash. A dinner was held for student leaders arriving early to campus. Students and organizations were informed about the capabilities for Dining Services to provide equipment and/or services for nonprofit events and promotions. The "Something from Home" program was expanded through a mailing to the parents of all students living on campus. Lindsey's introduced specialty sandwiches, Itza Pizza, Chick-Fil-A and "treat yourself right" items. The canteen offered nutritional breakfast items, dinner entrees, the Allegro Pasta Bar, stir fry, 59-cent hamburgers and 69-cent cheeseburgers. Uniquely Clemson products were added to the canteen menu and to the catering brochure.

The bookstore offered a full-service balloon center, compact discs and tapes, Ganz and Applause Plush gifts, fresh-cut roses for Valentine's Day, Classy Wrap balloon stuffing, the top 10 bestsellers, Russell Stover candies, the Coaches' Collection line of clothing items, 14k gold Clemson jewelry, computer software, Rayban sunglasses, Hanes underwear and Blue Mountain Art greeting cards. Central Stores increased the number of product lines in both office supplies and janitorial supplies from 396 stock items to more than 700 stock items. New stock items included FAX machines, typewriters and calculators.

The motor pool added a late shift for vehicle repair and servicing. The late shift allows inspection, repair, refueling and washing for customers unable to bring in vehicles during the day. Agricultural product sales expanded evening and Sunday operating hours in response to customer requests. Business during the expanded hours is about 18 percent of total sales and growing. Printing Services changed its closing time from 4:30 to 5 p.m. to allow customers to deliver work on their way home. Business hours on Fridays were extended to 5 p.m. in the Union Copy Center at the request of students.

The University Postal Service reduced campus mail delivery times from 24 hours to "same day/next route" service. A "mid-route" drop of outgoing mail and modifications of the internal handling process ensure all correspondence is metered and mailed on the same day. Stamps were offered for sale at the East Campus Convenience Store in response to student requests. The motor pool purchased a new paratransit shuttle bus to meet the requirements of the Americans With Disa-

bilities Act and updated the vehicle scanner, a computerized diagnostic tool, to allow mechanics to quickly read the diagnostic codes.

Telecommunications coordinated the installation of special telephones in the president's office and the police department as part of the state's emergency network. A new closed circuit and CATV loop was installed at the football stadium, and a new public address system was installed at the soccer stadium. The call trace feature was added to the University phone system, and a digital alarm reporting system was purchased. The alarm system receives fire, intrusion and other alarms from any University building. Since the system uses standard ESSX communication lines, expensive dedicated lines are not necessary. Additional equipment will need to be purchased for each building utilizing the service. The first application will be fire alarm service for the Environmental Systems Engineering Building in the research park. Additional Telecommunications activities included: bids were designed and solicited for a campus video communications system; fiber-optic cable was installed in Lightsey Bridge Apartments, Poole Agricultural Center, Riggs Hall, Earle Hall, Freeman Hall, Lowry Hall and Olin Hall; phone equipment was relocated at Littlejohn Coliseum and the Richland County Extension Office; a rewiring project was completed in Riggs Hall; five new emergency phones with blue lights were installed to enhance the campus emergency telephone system; equipment and wiring for a local area network was installed in the motor pool; a product trial was begun for Southern Bell's voice mail service; and a new telephone system was installed in the Clemson House to support the hotel operation.

Printing Services initiated a pick up and delivery service. Most jobs are picked up that day, finished and delivered back to departments within 24 hours. Typesetting proofs also are returned to customers via this service. Coated paper stock, recycled paper products, and soybean inks were introduced. A new computer allows the Union Copy Center to access the PUBNET copyright permission service for a 24-hour turnaround of copyright requests. The same computer is used to maintain the copy center's inventory system. The copier management program has placed all available copiers and is seeking methods to improve and expand the program.

The Ingram's "Book in Print Plus" system has been fully implemented for trade books by the bookstore, and sales have increased from \$20,000 to \$144,000. The bookstore also opened a state botanical merchandise center in the bookstore and had a sales booth at the S.C. Botanical Garden dedication ceremonies. Vending Services added 10 VeryFine juice machines and worked with Coca-Cola to develop specific plans to solve vending problems. Additional vending machines were added to the renovated area in Brackett Hall. Used books accounted for 40 percent of total textbook sales, resulting in significant savings to students. The bookstore sponsored several promotions including: a back-to-school fashion show, "great to hate Florida State" weekend, Clemson authors signing, Greek fair, software fair, and Market-Source CampusFest.

Central Stores began accepting orders by FAX and initiated a special order program for merchandise not stocked in Central Stores. Central Stores substantially reduced the number of backorders and reduced the time to deliver merchandise after the receipt of the order by 50 percent. Existing overstocks continued to be reduced, resulting in an expansion of the total product mix with little additional increase in the total dollar inventory investment. The University laundry issued new uniforms to personnel in FM&O. Delivery service was instituted for menu items from the canteen and Li'l Dino. The East Campus Convenience Store became the largest campus employer of students by paying more than \$127,000 to student employees. The number of student workers also increased in the card access office, giving the office a direct link to the wants and needs of the student population.

Increases in sales and the emphasis on offering new products, better service and improved accountability resulted in the purchase and modification of major equipment. Transportation Services installed a new computerized billing, vehicle maintenance and dispatch system — FASTER. The system enables management to retrieve "real time" information on the total Transportation Services operation. A new

automated transportation management program also was purchased and installed. The motor pool converted to computerized maintenance shop work order processing and completed a transportation services facility study illustrating problem areas in the current facility. A new freon recovery machine was placed into service, two new police scooters were purchased, and a new truck underframe vehicle hoist was acquired for use on shuttle buses and dump trucks.

University Postal Services repaired and relocated a mechanical mail sorter to sort incoming bar-coded mail from the U.S. Postal Service. Telecommunications established a storeroom concept for supplies and began a new inventory control program. New seating was placed in the Telecommunications lobby for customer comfort, University and local city directories were placed in the lobby to provide customers access to numbers without incurring directory assistance charges, and a suggestion box was made available. Agricultural product sales installed a new milk triprocessor and new point-of-sale registers connected to the card access system. A state-of-the-art bar-coding system for product purchases also was installed in the CATS store. The bookstore installed a 3M electronic anti-shoplifting system and implemented a communications connection between the bookstore computer system and the card access system to verify Tiger Stripe purchases. The bookstore also remodeled the computer room and reception area and instituted a new inventory control system. Central Stores installed a data terminal in the showroom to accommodate walk-in customers.

Printing Services added a new film processor, plate processor and numbering equipment. The Novell computer network was expanded to include the inventory and estimating system. A Pak Rak I cart was purchased to transport completed duplicating to the finishing area. The cart was so useful that a second one was purchased. The typesetting computers were equipped to accept high-density disks, and a numbering, perforating and scoring machine was acquired. Polaroid slide equipment was offered to enable in-house slide production, the Kirk-Rudy labeling equipment was serviced to correct labeling problems, and a new water system, a paper feed system and big foot suckers were installed on the AM1850 offset press. New clutches were added to offset equipment to improve speed. A state-of-the-art Ricoh color copier was installed in the Union Copy Center and a Ricoh copier with a coin-op was installed in the Learning Center.

The University Postal Service took a number of steps to improve services. Extensive data was compiled on mail volumes and other mail production criteria to assist managers in long-term forecasting, efficient scheduling, supervision and enhancement of mail services to the University. A campaign was initiated to standardize departmental addresses. Full implementation of standardized addresses will increase the volume of incoming mail which can be sorted mechanically and will speed up the delivery process. A transit study of mail to Germany resulted in a change of the international mail courier contractor. Postal Services worked with the Extension Service to reduce mail costs by consolidating outgoing/incoming mail through the use of mail pouches.

The multitude of new services and equipment created a strong need for additional training of personnel and users. The motor pool trained mechanics in air conditioning maintenance, Chrysler's passive restraint system, Chrysler's throttle body injection system, OSHA regulations, four-wheel anti-lock braking systems and operation of the freon recovery machine. The motor pool also renewed the ongoing association with the Automotive Council at Greenville Technical Community College, enabling mechanics to receive training on Ford, Chrysler and General Motors products at no additional expense. Postal Distribution Center employees toured the main post office in Greenville to observe mail processing.

Printing Services employees received ongoing safety and health training, including a hazardous chemical seminar and a hands-on demonstration on the use of fire extinguishers. Cross training was emphasized for different areas in Printing Services and Central Stores. Employees also were trained in using coated stock and the set up of different pieces of finishing equipment. The Union Copy Center devel-

oped student employee manuals to assist in training student employees. Dining Services employees received nutrition training including the "Treat Yourself Right" program, the importance of a good breakfast, cooking light and nutritional information for persons in their early 20s. All Business Services operations were photographed on the first day of the fall semester and slides prepared from the pictures. The resulting slide show depicting the operations from a customer's perspective then was shown to all directors.

The Student Receivables System was utilized to collect Telecommunications past due bills, resulting in the collection of approximately 72 percent of past due student bills. Collections were increased on all other Business Services receivables. Controls were implemented on employee discounts in the bookstore, and a better reconciliation process was developed for the Tiger Stripe liability account. A written accounts receivables policy for the bookstore was developed, and the automated bookstore accounts payable program was brought online. An aggressive collection policy was instituted, resulting in a substantial decrease in the number of outstanding credit memos. Monthly reports were prepared for cash flows, Tiger Stripe sales, utility expenditures, budgeted vs. actual salaries, Taco Bell and Li'l Dino subs sales, and other special reports as requested.

Year-end close-out procedures, including physical inventory, were coordinated for all units, and all departments began utilizing the computerized leave system. Surveys were completed on operations and salaries for the National Association of College Stores. A monthly payment plan from the Athletic Department to the bookstore was implemented for athletic scholarship book charges. Business Management worked to streamline accounting operations and coordinated with internal auditors on all audits of Business Services' units.

Business Administration

The Financial Affairs office coordinated the implementation of the IMRS financial reporting software. This effort allowed Business and Finance to add flexibility in management information reporting without a complete overhaul of the existing administrative systems. Interim financial statements were created for the University, and operating statements including cash flow and profit and loss statements were developed for Business Services.

The Business and Finance Division's annual budget was processed to provide the Budget Office with a cohesive package, and a productivity study was published. The *Productivity Study* gathered financial information for each Business and Finance area for the base year of 1986-87 and for each succeeding year through 1991-92. The dollar and FTE figures were compared and analyzed to yield conclusions on the operating performance of the division. This will be a continuing process as one part of the assessment phase of the Business and Finance Continuous Improvement Process.

Other financial analyses were provided, including estimations of costs involved in monitoring fixed assets and selected travel costs in Business and Finance. Cost savings or avoidance then were projected and provided for use in developing budget strategies.

Business and Finance processes were reviewed for appropriate controls including the distribution of payroll checks. Financial Affairs served as a liaison between Internal Audit and Business and Finance. This included advising on audit responses, implementation of audit recommendations, and researching compromise solutions to control concerns noted in audit reports.

Facilities Planning and Design

This program area includes planning, project and construction management, and property management of the University's facilities, including campus master plan-

ning, real estate development, maintenance of the facilities data base, property records, and capital building and renewal projects.

Progress in campus building and renovation programs continues in line with the 10-year facilities plan, representing more than \$350 million in projects, which was initially approved in September 1987 and updated in spring 1992. Projects under construction include the demolition and reconstruction of Johnstone Hall, The Brooks Center for the Performing Arts, the Fluor Daniel Engineering Innovation Building, and a renovation of Harcombe Dining Hall. A renovation of Kinard Annex, renovations and an addition to Jervy Athletic Center, the Bishop Center for Ceramic Engineering Research, an animal research compliance facility, and the Clemson Continuing Education/Conference Center and golf course are scheduled to begin construction in FY '93-94. Projects in the design phase include the new Student Center, the Visitors Center, renovations to Poole Agricultural Center and the University Office Building, which will replace space currently leased by University departments.

During the last two fiscal years the Brackett Hall renovation, a student cafe, the Thornhill Village Community Center, renovations and an addition to Lee Hall, renovations to Newman Hall, a lodging building at the 4-H Cooper Leadership Center, and the Musser Fruit Research Center have been completed. Memorial Square, donated by the Class of '44 and located in front of Mell Hall, and the Carillon Garden, donated by the Class of '43, also were completed in FY '92-93. Additionally, work has continued on the campus renewal and replacement plan. Since 1990, 49 deferred and major maintenance projects representing an investment in excess of \$15.3 million have been initiated. Many of these projects already have been completed.

The Department of Space Resources is nearing completion of the data collection and verification phase of the facilities data base update effort. The Department of Property Management played a significant role in development of provisos associated with regulatory reform legislation, which was passed in June 1993, and continues a strong working relationship with state agencies involved in the permanent improvement project process.

Facilities Planning and Design continues to improve services and to identify new and innovative ways to effectively implement projects on the Clemson campus.

Facilities Maintenance and Operations

FM&O completed approximately 300 work orders for repair and renovation of facilities. The turn-around time for the completion of work orders has decreased from three years to 7.5 months. White paper recycling was instituted during the year with services provided to 63 buildings.

The Maintenance Planning and Control (MPAC) computer system became completely operational, providing enhanced on-line access to consolidated data entered throughout Facilities Planning and Management. Automated billing statements are produced and distributed to departments, and electronic data transfer to the main-frame allows deductions or credits to departmental accounts through the Accounting Information System.

FM&O completed several in-house assessments on employees and facilities. These included an employee survey, the establishment of a career path task force, the follow-up on a customer survey, and a formula driven capital renewal/rehabilitation survey.

In conjunction with our division's Continuous Improvement Program, the challenge is to provide professional services within a limited budget, in a timely manner, and with a quality acceptable to the University customer. With this in mind, a list of critical success factors was established to measure the performance of FM&O.

The new training and work program, Maintenance Workforce 2000, has evolved from a multi-craft, multi-trade cross training of employees to include two

other significant initiatives: employee career paths and the zoning, or decentralization, of the University campus. The employee career paths will allow employees to advance in rank as they meet predefined skills and knowledge related to their trade or to University operations. Zoning assigns multi-craft teams to designated areas of the University. The teams are responsible for the maintenance, both preventive and repair, of their portion of the campus. The Landscape Maintenance and Custodial departments of FM&O already have assigned staff to campus zones.

Energy conservation efforts during the reporting period comprised the following activities:

- An internal environmental audit of the University was completed in April 1992.
- From this report, certain subcommittees were developed which now are at work; these include a construction and infrastructures subcommittee which will focus on energy conservation in the design of new structures.
- FM&O continues to direct efforts at optimizing the operation of the mechanical and electrical systems.
- More efficient lighting systems are being studied with the intent of possible changeover.

Projects successfully completed in 1992 include:

- Installed sidewalks and lighting campuswide to increase security.
- Supported campus activities including Tigerama and graduation.
- Started a testing procedure to evaluate the lead and copper content in the drinking water system.
- Established a plan to contain and virtually eliminate CFCs on campus.
- Established a committee to address ADA legislation.
- Increased recycling efforts to comply with Federal Regulations Subtitle D and the state Solid Waste Management Act.
- Developed a program to comply with current elevator codes.
- Performed air quality studies in Barre Hall, Lehotsky Hall and the Strom Thurmond Institute.

Projects begun in 1992 and continuing to 1993 are:

- Air quality surveys.
- Lighting and sidewalks.
- Utilities extensions.

In addition to repairs and renovations, FM&O maintains 5.2 million square feet of space; 750 acres of turf, trees and flowers; 20 miles of roads; 120 miles of sidewalks; 1.5 million square feet of parking lots; disposes of 4,000 tons of waste a year; provides 113 million KWH per year of electricity with a maximum demand of 17.3 megawatts; maintains the University's electrical substation; distributes electricity at 12,470 and 4,160 volts, 3-phase, through 16 major high-voltage circuits; purchases 507 million gallons of water with 1.5 million gallons of elevated storage capacity; produces 370 million pounds of steam per year using 17,000 tons of coal; provides 10,900 tons of refrigeration circulated through six miles of underground steel piping; maintains sanitary sewage collection and treatment of an average 1.3 million gallons of sewage per day; and maintains external lighting with approximately 800 fixtures and a power demand of 130,000 watts.

Personnel Management and Development

Personnel Management and Development consists of four major areas: Wage and Salary Administration, Payroll and Benefits, Personnel Services, and Em-

ployee Development. The associate vice president is responsible for overall administration and leadership of the University's non-academic human resource activities including classification/compensation activities, payroll and fringe benefits for faculty and staff, employee training and development, employee assistance program, employee suggestion program, retirement, employment practices and employee relations programs, and management information systems.

Personnel Services

The Personnel Services Office serves the employees and administration of Clemson through a variety of programs and activities. Examples of these programs and services include: employment referral services for all non-faculty (staff) positions; employee relations, counseling and guidance, training and assistance programs related to personnel services; retirement administration and counseling services; administration of some employee benefits such as leave, holidays and unemployment; policy development and administration; coordination and distribution of the *Personnel Policies and Procedures Manual*; maintenance of the official personnel records for the University; management and maintenance of the personnel data base, and the Division of Human Resource Management's data base.

Major accomplishments of this department during 1992-93 included:

- Complete refocusing of organization, cross training all employees in all service areas.
- Referred 7,983 applicants for non-faculty positions; total of 16,291 referrals.
- Performed testing services for 590 applicants and 235 background, criminal and credit reference checks.
- Managed recruitment and placement for 365 short-term employees for Educational Testing Service project.
- Assisted/counseled in 520 personal and 830 telephone employee relations concerns.
- Developed eight reduction-in-force plans involving 28 employees, successfully placing 18 by mandatory referral, resulting in only five finally terminated.
- Conducted 43 personnel services-related formal training sessions, utilizing departmental staff.
- Provided retirement services and counseling to more than 600 employees, with 105 retirements.
- Continued pre-retirement planning seminars for 193 employees.
- Conducted electronic leave training sessions for 60 departments and represented the University at five unemployment hearings.
- Completed cross-reference index for *Personnel Policies and Procedures Manual*; revised seven policies, implemented three additional, and continued effort to have manual available on computerized "Gopher" access.
- Implemented a new flex time and compressed workweek policy.
- Implemented a compensatory time for exempt employees policy.
- Implemented a new tuition assistance program allowing four free credits per semester for all employees.
- Assisted in the implementation of the Americans With Disabilities Act.
- Implemented an internal promotion policy campus wide.
- Provided information for more than 1,100 personnel record inquiries.
- Audited and processed more than 28,000 personnel actions; implemented electronic personnel actions in three departments and soon will be ready to implement across campus.

Wage and Salary Administration

Major accomplishments of this department during 1992-93 included:

- Received increased delegation of reclassification from the state; will be delegated 85 percent of classes once prototype position descriptions are completed.
- To improve our liaison and visibility, made visits to Columbia to gain and share information and ideas. Invited state analyst to Clemson to offer training.
- Conducted 16 seminars to educate the campus on how to write position descriptions that are in compliance with ADA, noting essential/nonessential functions. This was double the number conducted last fiscal year.
- Assisted and advised the FM&O Career Path Task Force. Developed job specifications, conducted workshops, conducted survey to support four new classifications and spent a day in Columbia defending the proposed career path which was approved.
- Conducted 157 job audits; responded to 15 salary surveys; reviewed 812 dual employment request forms and 83 hire above minimum requests. Approved/received approval of 475 reclassifications — a 98 percent approval rate.
- Completed entering state job specifications utilized by the University on DORIS; data base developed; Trained users on how to access specifications at the FY '92-93 Benefits Fair.
- Developed new internal dual employment form, CUBO-430, to simplify processing; produced first report of all dual employment requests approved.
- Requested of the state and received approval of a new supplement (the research supplement) for unclassified employees.
- Received authority from state to approve monetary recognition awards for unclassified employees.

Payroll and Employee Benefits

The Payroll and Employee Benefits Office provides service and support in the areas of compensation and employee services, the administration of mandatory and voluntary benefit programs for employees, and the management of the University's contribution to all benefits programs. Major accomplishments of this office for 1992-93 included:

- Completed fall enrollment for the state health insurance program with scheduled meetings on campus and at all off-campus locations.
- Re-enrolled the medical spending account and the dependent care spending account through the Money-Plus Flexible Benefits Plan.
- Sorted and distributed W-2 Forms for all active employees with their paychecks, resulting in significant savings in mailing costs for these forms.
- Conducted the fourth Benefits Fair to explain employee benefits; approximately 1,600 employees participated with 69 exhibitors.
- Continued the payroll procedures workshops to inform administrative employees of appropriate payroll procedures and to assist in their understanding of the payroll/personnel system.
- Revised the VHS orientation tape for new employees to reflect changes in the insurance program and distributed it to all off-campus locations.
- Implemented a Vision Care Discount Program for all University employees.
- Held informational meetings for the University-approved Retirement Incentive Program; enrolled 60 employees for insurance taking advantage of this program; worked with many on 403b, 401K and 457 programs.

Employment Development

The Employee Development Department is responsible for providing training seminars, workshops and conferences for all University employees. The department also is responsible for administering the Employee Assistance Program and the Employee Recognition Program. Major accomplishments of this office for 1992- 93 included:

- Conducted 87 seminars/workshops.
- User Driven Design; annually conducts a training needs survey to all employees and SAS analysis of respondents' input. In addition, analyzed the data from all participants which is to be used to design the training program for FY '93-94.
- Total seminar/workshop participants: 2,699 participant evaluations of the various workshops indicated a very high degree of acceptance.
- Coordinated Associate in Business Training Program for secretarial and clerical employees. The program has been extended to other areas.
- Distributed alcohol and other drugs policy to all permanent employees. Also included policy and vocational rehabilitation information in new employee orientation.
- Counseled and referred 29 employees to vocational rehabilitation or other counselors for advice and guidance.
- Distributed 202 service pins for Clemson employees.
- Designed and coordinated Americans With Disabilities Act training and implementation at Clemson.
- Coordinated Employee Suggestion Program. Total suggestions — 45. Total awards — 2; 592 percent increase when compared with 1991-92. Clemson submitted the most suggestions to the state during July 1992 - January 1993. We distributed 1,200 ESP brochures at the 1992 Benefits Fair.
- Revised new employee orientation to include more speakers to provide a broader overview of the University and accompanying benefits.
- Assisted with development and implementation of Career Path Program.

Administrative and Quality Management

The Office of Administration and Quality Management is responsible for Business and Finance Quality Initiatives, Business Research and Assessment, Business Information Systems, Facilities Information Systems, Communications, and other related programs.

Administration and Quality Management worked with University employees in FM&O, Employee Training and Development, and Wage and Salary Administration to design a career path program for FM&O. The career path concept, as designed by Clemson employees and approved by the Division of Human Resource Management, clearly defines the skills, knowledge, and abilities necessary for advancement to the next step. These requirements are obtained through a combination of on-the-job training and professional development courses. Once an employee has acquired the necessary skills, knowledge and abilities, advancement to the next career path step is automatic, provided the employee's performance in the current step is satisfactory. Task forces for Business Services and Business and Finance Administration have begun designing the frameworks for additional career paths.

The Business and Finance Continuous Improvement Program forms the core of the division's quality initiatives. Fourteen task forces have been formed to review major processes within Business and Finance and to recommend improvements. Major processes studied so far include work orders, purchasing and accounts payable, employment, travel and cash management. In addition, task forces have developed policies on work rules and ethics. Recommendations from the task forces are consolidated into one document, and updates on the implementation of the recommendations are published three times a year.

The quality initiatives also include a number of cross-functional advisory committees created to advise the vice president on policy issues. The cross-functional committees review issues and recommend policies for quality programs, accounting and business standards, facilities, financial planning, investments, human resources, compliance and cost standards, computing and information management, and auxiliary services. The vice president also has formed the Employee Relations Council and Human Relations Council to address issues concerning front-line, women and minority employees.

Efforts to improve internal communications accelerated with emphasis on salary and compensation issues, budgets, formula funding, and Business and Finance accomplishments. *Kudos* was distributed to all employees, and the Business and Finance *Strategic Plan*, *Annual Report*, and the *Productivity Study* were published.

The Communications Department coordinated the design, photography, and printing of the *Clemson University Bookstore Catalog*, and catalog sales increased by 17 percent. A *Transportation Booklet* was placed in all motor pool vehicles, and accomplishment books were compiled for each area in Business Services. Advertisements for the bookstore were designed for appearances in athletic event programs and in *Clemson World*. A new logo was designed for the bookstore and incorporated into all promotional materials.

Business Information Systems

Business Information Systems (BIS) continues to provide support for desktop computing, networks, software solutions, and training to Business and Finance. BIS assisted numerous departments in upgrading existing equipment which cost far less than complete replacement. Additional network equipment also was installed between College Station and Sikes Hall, allowing College Station departments to share information with on-campus personnel.

BIS completed a major project with Business Affairs to develop an on-line American Express card payment system. This system allows departments using a new departmental credit card to receive and pay their monthly invoices online. Business Affairs then can review the invoice online and approve it for payment to American Express. The system allows on-line access to the status of invoices, payment history, outstanding balances, a cardholder data base and more. The departmental credit card system is being implemented throughout the campus.

BIS continued to provide maintenance of departmental computing equipment which otherwise would necessitate expensive maintenance contracts. BIS continued to assist departments in acquiring software and hardware at the best prices. Additionally, BIS installed metering software which allows copies of software to be shared on the network to avoid the cost of acquiring a license for every user.

Facilities Information Systems

Accounts Payable Interface

During the past year Facilities Information Systems (FIS), in conjunction with Information Systems Development (ISD), modified the MPAC system to include an interface to the University's checkwriter. This new enhancement provides an ability for the facilities division to enter accounts payable data into the MPAC system and match to orders via system edits. The data then is electronically transferred to produce a vendor check in the instance of direct purchase vouchers.

Facilities Business Systems was certified by accounts payable to perform auditing tasks associated with the accounts payable interface between MPAC and the checkwriter. Paper voucher transfer was eliminated after certification, and inquiry capabilities improved dramatically. Users ascertain the check number and date of payment to vendors as soon as checks are cut without waiting for mainframe processing. The time necessary for vouchers to be processed was decreased dramatically — from approximately two weeks or more to three days or less.

Capital Project Tracking System and Interface

FIS and ISD also worked in conjunction to develop a capital project tracking module within the MPAC system with associated interfaces to the campus main-frame's AIS system. The system was designed to track plant fund expenditures and fund balances properly to facilitate accounting and project management.

This module now is in the implementation phase and handles all relative accounting transactions to capital projects. The system provides life-to-date totals and detail of all expenditures and budget transfers not heretofore consolidated into one system. The work order system used for project support, as well as all campus maintenance, repair, and renovation, also is integrated into the system and allows project managers in a separate location of the campus to communicate centrally with on-campus project planners and other managers.

Space Planning and Key Maintenance

An enhanced space planning data base was developed within MPAC by FIS to facilitate statistical analysis of room usage and amenities. Key personnel will be trained to access data using the system during the next several months.

A key maintenance system also was integrated into the MPAC system by FIS to facilitate the locksmith shop in key tracking. Campus security also will benefit from the enhanced indexed data base of issued keys.

Employee Relations

The Business and Finance Employee Relations Council was formed in 1986 to serve as a communications link between the vice president and the more than 500 non-exempt employees in the division.

During FY '92-93, the Employee Relations Council (ERC) met six times. In addition, the ERC coordinator and the vice president met with employee groups from: ag sales; ID Services; CATS store; the bookstore; Purchasing and Central Stores; Financial Planning and Management; facilities, Planning and Design; FM&O office staff, and many of the shops within FM&O. Those shops included utilities, asbestos abatement, facilities business management, maintenance stores, construction services, carpentry, locksmith, electrical, cabinet, sheet metal, roofing, paint, plumbing, preventive maintenance, air conditioning, landscape maintenance and the many employees of custodial services. Many of the shops within FM&O were combined in representation to assure all areas received the opportunity to speak first hand about concerns within the division.

Accomplishments in FY '92-93:

- Continued improving communications with the vice president regarding concerns within the division.
- Provided updates to employees relating to changes as a result of state regulatory relief reform.
- Communicated status of Career Path implementation and provided answers relating to employees positions, salaries, training and achieving goals.
- Addressed a number of employee issues ranging between thermal vests for employees working in extreme heat to improving lighting along walkways.

Goals: Reduce response time to employee concerns, better communication among departments, enhance work environments for employees, and continue to improve employee morale.

INSTITUTIONAL ADVANCEMENT

1992-93 Overview

The year ending June 30, 1993, can be summarized as a successful year of transition for the Division of Institutional Advancement following the conclusion of the Campaign for Clemson. Cash flow generated during the campaign was sustained, and private assets continued to grow. Transition also occurred structurally within the division. State-mandated budget cuts caused a thorough analysis of institutional priorities and a reorganization of functions for greater efficiency and to eliminate all potential for duplication. Passages of personnel brought new faces and meant saying goodbye to some old faces in senior positions. The coming of new faces brought renewed innovation and energy. Volunteer and staff teamwork continued to pave the way for progress in Clemson's external operations.

- \$19 million in gifts were received during the fiscal year — a 10 percent increase when compared with the previous year. The average dollar amount of each gift increased from \$888 in FY '92 to \$989 in FY '93. The total number of gifts dropped from 19,340 to 19,183. Total giving from individuals reached \$9.5 million — a 43 percent increase when compared with the previous year. Corporations gave \$5.6 million, while foundations and other organizations gave \$3.9 million. Corporate matching gifts were up 31 percent, and the number of faculty and staff donors increased from 896 to 1,161, although the dollar amount dropped from \$245,000 to \$182,000.
- The cost to raise a dollar declined for the third year in a row as 10.39 cents was spent to raise each dollar received. This is down from 11.72 cents in '91-92, 11.93 cents in '90-91 and 12.62 cents in '89-90. The national average is approximately 16 cents on the dollar.
- The University's combined endowment rose 14 percent from \$67 million to \$75 million. The managed endowment pool of the Clemson University Foundation experienced an investment performance return of 10.28 percent. This represents 12.75 percent return on equities, 12.27 percent return on fixed income investments and 3.42 percent return on cash.
- The deferred gift inventory rose to \$38 million, up from \$29 million in '91-92. The inventory contains \$23 million in bequests and \$15 million in trusts, insurance and other deferred mechanisms.
- The philosophical change in FY '92-93 from the pursuit of unrestricted gifts to an exclusive pursuit of restricted gifts can be credited with some of the increase in total giving. The change, however, prompted a thorough assessment of the options to achieve a consistent level of spending in the Foundation's unrestricted budget. New revenue streams were identified and adopted by the Foundation board of directors. Solving the unrestricted budget dilemma was a major accomplishment near the end of the fiscal year.
- Two associate vice presidents said goodbye to Clemson. Francis Canavan left his position as associate vice president for public affairs to become a group vice president with the National Collegiate Athletic Association (NCAA). Harry Durham, associate vice president for university relations, retired at the end of the fiscal year after 30 years of service.
- Dr. James Daniels was appointed associate vice president for governmental affairs and executive director of state government relations in January '93. He immediately brought an organized approach to determining the University's legislative agenda and prioritizing all items relating to the S.C. General Assembly. A legislative advocates group was formed. Campus communication and coordination were dramatically more focused and improved during the 1993 legislative session. Of particular note was measurable

progress in creating regulatory flexibility, thus giving the University greater relief in bureaucratic and regulatory procedures. In addition, higher education was given a high priority for access to the excess revenue pool which came available at the end of the state budget cycle.

- An extensive reorganization occurred, affecting most of the communications units in the division. Programs related to News Services, the Communications Center, Internal Communications, Community Relations, and Publications and Graphics, including the *Clemson World* magazine, merged to create a new unit of Public Affairs. Cathy Sams was selected to be the associate vice president for public affairs. Programs related to Alumni Relations, the Visitors Center and Historic Houses were merged to create a unit called Constituent Relations. Debbie DuBose was named associate vice president for constituent relations.
- A University communications team met regularly throughout most of the fiscal year. Senior personnel in News Services, Alumni Relations, Publications and Graphics, and Constituent Communications created proactive approaches to deal with emerging issues. The group resolved several dilemmas relating to internal and external communication.
- The Office of News Services won a second consecutive gold medal from the Council for the Advancement and Support of Education (CASE), marking two consecutive years in which Clemson's operation was judged to be the nation's best news program among all colleges and universities.
- Campus enhancements marked the efforts of two classes. The Class of '43, at its fiftieth reunion, dedicated the Carillon Gardens, a landscaped and terraced project which dramatically improved the area between Tillman and Sikes halls. The Class of '44, in anticipation of its fiftieth reunion, dedicated an important sculpture commemorating the memory of Clemson's war dead. They also announced intentions to build a new Visitors Center near the entrance to campus.
- Year-end budget cuts continued to take their toll on the division. For the third year in a row, multiple cuts in the state-appropriated budget caused a decline in operating budgets and a reduction in services and service capability. Continued budgetary retrenchment in the new fiscal year caused a reduction in force which consummated in the loss of seven positions at the end of the fiscal year. Four programs were either eliminated or significantly altered, including programming related to Historic Houses, the Alumni Marketing and Travel program, the Art Department in the Communications Center and the Corporate Development program.
- The associate vice president for development position continued to experience transition with the appointment of Roger Penland in October and his subsequent resignation in March. The search for a permanent replacement was resumed at the end of FY '92-93.

Public Affairs

The 1992-93 fiscal year was one of transition for the Department of Public Affairs. After the resignation of former Associate Vice President Francis Canavan in September 1992, the position was frozen to accommodate a mid-year budget cut. Anticipating the retirement of Harry Durham, associate vice president for university relations, an internal audit aimed at reorganizing the two units was instituted. In the interim, the directors of News Services and Constituent Communications reported directly to Vice President Gary Ransdell, while Governmental Affairs was assigned to Associate Vice President Jim Daniels.

The new Public Affairs area includes News Services, Publications and Graphics, and Electronic and Photographic Services. The internal news functions of the former Department of Constituent Communications were merged into the Department of News Services, while Publications and Graphics assumed responsibility

for *Clemson World* magazine. In addition, the associate vice president for public affairs (a position now filled by Cathy Sams) serves as the chief public relations officer for the University and public relations counsel to the president and other administrators.

Following are year-end reports of departments within Public Affairs.

Department of News Services

Fiscal Year Highlights

Awards

- Recognition at national meeting of CASE, which awarded News Services its highest award — the gold medal — as “best overall news and information program” for the second consecutive year!
- Two CASE (regional) District III awards for 1993 — a Grand Award in features (archaeology project) and an Award of Excellence in news (Hurricane Andrew/CHAMP). The *President's Report*, a joint project of News Services, Constituent Communications, and Publications and Graphics, also won a CASE District III Grand Award for annual reports.
- Two writing awards from the Carolinas Association of Business Communicators.

Opportunities

Hurricane Andrew: To capitalize on national media coverage of Hurricane Andrew, News Services called on the faculty expertise Clemson earned through study of Hurricane Hugo. Efforts have included:

- Tip sheets distributed to national media, pitching sources of information before, during and after the hurricane.
- Accompanying wind engineers on analysis trip through devastated areas (and coordinating media coverage of that trip).
- Overseeing release of report from that analysis and generating widespread national coverage of same (three news releases, additional tip sheets).
- Two satellite uplink interviews with CNN.
- Op-ed to *Miami Herald*.
- Coverage of faculty member's testimony in Washington (including C-Span).

Innovations

The Clemson University Bulletin Board, CUBB, continues to gain favor with the media as a one-stop shopping electronic approach to receiving information from News Services by personal computer. It was placed into service last September. In addition to making all of our news releases available to reporters 24 hours a day, CUBB also offers the latest versions of our Clemson Daybook and Press Memo (both described later). Reporters dialed into CUBB with their computers more than 250 times during this fiscal year (we only started documenting CUBB log-ins in January after a three-month shakedown period), and we expect that number to increase dramatically in the months to come as we expand the service and enter a more aggressive marketing program for it in '93-94.

Media Relations

- Managing release of information pertaining to Clemson's response to an NCAA inquiry. A statement and summary of information in the report were distributed Aug. 7 to the news media, the University community (via a special “*Inside FA X*”) and constituent groups. News media also were provided an opportunity for one-on-one interviews. In response to requests under the

S.C. Freedom of Information Act, full response and exhibits were edited and released to the Associated Press and other media on Monday, Sept. 14.

- Managing extensive media coverage related to the investigation into the disappearance of Norsaadah Husain, the discovery of her remains and the on-campus memorial service.
- *Greenville News* editorial board meeting Aug. 31 with Ron Kendall and follow-up visit to the Institute of Wildlife Toxicology (TIWET) on Sept. 24, resulting in Sunday op-ed bylined by Kendall and improved news coverage of research.
- Campaign finale — front-page local coverage, wire coverage, prominent coverage downstate in major dailies (Columbia, Charlotte, Charleston), live television coverage during event, local op-ed.
- Extensive feature coverage for AIDS quilt coming to campus.
- Conducted media training workshops for Agricultural Sciences department heads, student peer educators, Engineering department heads. Co-sponsored an executive workshop on crisis management for president and vice presidents with Department of Public Safety.
- Conducted internal communications audit and faculty/staff focus groups, out of which came recommendations for improving internal communications on campus. Several recommendations — a change in the general faculty meeting format, revival of the Faculty Senate's "Open Forum" and inauguration of an electronic University information service — have been instituted. More recommendations are expected to be implemented in '93-94.
- Developed a community relations communications strategic plan.
- College of Nursing 25th anniversary year-long celebration (Silver Jubilee).

Activities Overview

The Department of News Services uses a variety of methods to evaluate its effectiveness. Analysis of media contacts by the department's six professional staff members and clips resulting from those contacts are an integral part of the department's activities.

Representatives of the media are contacted by News Services in person, by telephone and by written information in the form of news releases, a daily electronically delivered tip sheet called the Clemson Daybook and a weekly tip sheet called the Press Memo. Written information is disseminated either by paper mail, fax or electronic mail, depending upon the media outlet's preference.

News Releases

News Services distributed 1,306 news releases during 1992-93. Not counted in this total is the output of our hometown program which distributes news releases about student achievements and honors. During the year, 863 hometown releases recognizing 8,255 individuals were sent out.

Daybook

The Clemson Daybook is sent by fax or computer electronic mail to 20 media outlets daily. In addition to listing upcoming events, the Daybook lists sources at Clemson who can provide information on breaking news stories.

In 1992-93 the Daybook provided information on 346 events and 441 sources.

Press Memo

The weekly Press Memo lists upcoming events for the following week to help the media plan its schedules. In 1992-93 the Press Memo noted 280 events.

What's Happening at Clemson

A monthly calendar is distributed to inform media of more long-range events.

Clip Analysis

The S.C. Clipping Service provides clippings from all newspapers in the state of all Clemson stories. In addition, News Services maintains clips from national publications and a video monitoring service inhouse, as subscriptions to national clip and video services at a national level are prohibitively expensive.

In 1992-93, News Services was able to document 4,515 mentions of Clemson University in S.C. newspapers. This number represents a total of 1,143 different stories that ran in multiple newspapers. Of those, 740 were stories the News Services department generated, and 134 more were stories the department assisted reporters in writing.

Media coverage of activities in the University's Strategic Plan emphasis areas is a priority for News Services. In 1992-93 we documented 349 stories which addressed at least one emphasis area.

Constituent Communications

To streamline operations and maximize efficiencies within the Division of Institutional Advancement, at the close of the 1992-93 fiscal year the Constituent Communications unit was dissolved, and its responsibilities and staff members were transferred to other departments within the division. To reduce production and mailing costs, plans were laid to merge the University's two flagship constituent publications, the *Clemson World* magazine and the *Clemson World News* tabloid. The resulting publication, a larger and re-designed *Clemson World* magazine, will be produced by the Department of Publications and Graphics Services. Internal and constituent news services, including *Inside Clemson*, the faculty-staff newspaper, are now the responsibility of the Department of News Services, thus merging the University's internal and external news programs. In its final year, the Constituent Communications unit:

- Produced three issues of *Clemson World* magazine.
- Produced two issues of *Clemson World News*.
- Produced 24 issues of *Inside Clemson* and numerous Inside FAXES, News Specials and electronic-mail notices.
- Assisted President Lennon with 20 issues of the *President's Letter*.
- Produced eight issues of the This Month at Clemson community calendar.
- Produced three issues of The Clemson Fund Partnership Report.
- Produced four donor profiles for the *Horizons* deferred-giving newsletter.
- Produced five alumni profiles for the 1993 alumni directory.
- Provided to News Services numerous hometown news releases announcing alumni-related honors, awards and appointments.
- Wrote and helped produce the *1992 President's Report*, which won a District III Grand Award from CASE.
- Established, launched and maintained the "CU Calendar of Events," the University's on-line master calendar data base.
- Assisted with numerous special projects and assignments, such as helping Personnel Services announce new programs and benefits for employees, helping public safety produce "suspicious person" notices, helping the parking task force conduct its study and prepare its report.

Publications and Graphics Services

The Department of Publications and Graphics Services provides marketing research, design, writing and production expertise to produce collateral materials that support the University's efforts to recruit students, faculty and staff; develops materials to enhance fund-raising efforts; produces advertising-oriented promotional materials for campus events; and is responsible for consistent implementation of the University's identity program in publications.

This year we have continued to focus on publications that will garner the maximum benefits for the public relations efforts of the University. The director joined a

four-person public relations advisory committee that examines issues facing the University. This enables both the news and publications wings to decide on approaches and send the same messages to the public through the written and spoken word.

We also have continued to focus on the overall admissions recruiting effort. This year we began producing the final wave of admissions publications at the departmental and college level. The College of Engineering and the Department of Textiles, Fiber and Polymer Science now have major recruiting publications. Focus group interviews have begun for Horticulture. As a result of our research with undergraduate audiences, we have identified several consistent areas of information that all students want. We developed a questionnaire for clients to fill out to provide that information, thus streamlining the writing phase for recruiting publications.

We have applied focus group research to other areas of Institutional Advancement as well. This year we conducted focus groups with alumni in Atlanta, Charlotte and Columbia. This information, when coupled with other research data that was obtained from other sources within the division, provided valuable insights for alumni programming as well as applications for the re-design of the *Clemson World* magazine.

Facing a reorganization scheduled for July 1, 1993, our approach to equipment purchases was aimed at accommodating new work stations for added staff members. We upgraded memory, integrated equipment and programs, and expanded our network to meet the various functions that were added to the department. Moneys that had been designated for equipment and system upgrades were transferred back to Institutional Advancement to help cover budget cuts suffered this fiscal year.

Computer technology continues to provide opportunities for efficiency. This year we brought online an estimation program that will enable us to give estimates on printing projects almost immediately, replacing the labor-intensive and time-consuming process that existed before. We also have gathered into one data base all computer graphics that have been developed for use in publications over the past several years. This enables the designers to re-use graphics and pull from existing files to customize art for other uses.

In 1992-93 the department completed 464 jobs and carried over 78 jobs into the new fiscal year. This is a slight increase when compared with last year and reflects our three-year goal of maximizing our production capabilities with existing staff.

Even with the increase in number of jobs, we were able to again decrease the amount spent on printing. This year's expenditure for printing placed through our office was \$506,822, down from last year's \$521,114. This savings can be directly traced to our continuing efforts to stay current with the graphics industry in computer prepress technology.

This year, graphic designer Birgitte Shayne resigned, and we hired a temporary to fill her position through the summer. Sandra Parker returned in a temporary capacity to fill in for Odile Fredericks, who is on maternity leave.

It also was a year of recognition for the department. Dave Dryden received an Institutional Advancement Outstanding Employee Award, and Anita Albert was a faculty member at the CASE Design Institute. The admissions recruiting materials won a gold award from the Admissions Marketing Association. The golf course portfolio won a PICA Award, Clemson Home (housing publication) won two regional CASE awards and an award from SACSA. Other regional CASE awards include: *President's Report*, Grand Award and Award of Excellence; Victory Celebration, Grand Award and two Awards of Excellence; Sailing Beyond the Myths, two Awards of Excellence; and the Student Handbook cover and Brooks Center season announcement, Awards of Excellence.

Communications Center

Compared with 1992-93, 1991-92 was a benchmark year for the Communications Center because it reflected complete revamping of our equipment complement, thus enabling production of far greater numbers of products at significantly higher

quality. On the other hand, 1992-93 has seen the loss of 40 percent of our photographic staff and 12 percent of our operating monies to budget cuts. During the year, 70 percent of our staff voluntarily participated in the Cooperative Extension Service's leave-without-pay program, allowing that unit to downsize and right itself financially. In the year ahead we will lose our two-person Art Department to deal with the University's financial realities. However, in spite of these difficulties, the Communications Center staff continues to provide quality service to its clients and to seek new and innovative ways to overcome difficulties encountered.

There were some bright spots. During the year we were successful in securing funding for 14 additional satellite downlinks for county Cooperative Extension Service offices. This will expand the Extension Video Network to all 46 counties. We also were successful in designing, securing approval for and initiating a new Communications Center rate card, which will provide some recurring funding to maintain, repair and replace our equipment.

Aside from the loss of critical personnel, our major concern continues to be in the area of declining operating dollars. However, during the past year, we had some success in securing grants and contracts from outside sources, which allowed us to continue some operations which otherwise would have been curtailed and to purchase new camera equipment for the classroom studio.

After purging old titles and adding new ones, the media library increased its total holdings by 95 additional titles. In its first full year of operation, the on-line computerized catalog and ordering system has streamlined its processes and doubled the number of orders handled from 20 to 40 per day. The Audio Visual Equipment Loan Service complied with an average of 81 requests per week, a 21 percent increase when compared with last year's figures. In addition to the above, our one-person department continues to supply projectionist support services at an average of four times per week.

Midway during the year the Cooperative Extension Service added a satellite utilization coordinator to the Communications Center staff. As a result, the number of counties and departments utilizing satellite reception capability increased dramatically as did the number of hours of programming which were received and distributed on campus to faculty, staff, students and client groups. Though we keep no records on satellite utilization by the county Extension offices, the dramatic increase in on-campus satellite receptions is evidenced by the fact that in September 1992 we were averaging 5.25 satellite receptions per week. During the month of April 1993, we averaged 12 on-campus satellite receptions per week. With the financial difficulties experienced by the Extension Service, there was a temporary drop in the number of videoconferences produced during the year. However, in spite of these difficulties, nearly 40 hours of video transmissions were uplinked to sites across the state and nation. Our video tape duplication activity continues at a maximum capacity of about 100 in-house copies per week. Another 60 copies per week are produced out-of-house.

In spite of the loss of two of our five full-time photographic positions during the year, our Photographic Services unit continued with its high level of quality and quantity output, completing 5,840 work orders which included the shooting, processing and printing of more than 35,000 black-and-white images and the shooting, processing and mounting of more than 72,000 color slides.

The Art and Graphics unit continued its support of University academic and administrative units in providing instructional and speaker support, slides and graphics, as well as design and execution of original art and graphics for use in multi-image and video productions. Overall there was a 16 percent increase in the number of art orders completed, totaling nearly 2,000. Clients served included four vice presidents and 38 individual administrative units across the campus.

Because of the emergence of high quality, portable, big-screen video projection, the call for multi-image production is diminishing. Coupled with the upcoming loss of our Art Department, we can anticipate an additional decrease in the number of multi-image shows produced. However, it should be noted that we continue to pro-

duce and update several three-, six- and nine-projector shows for major events as well as student orientation and faculty and staff orientation.

Audio/radio production included more than 40 soundtracks and 312 Plant Professor radio programs, which were aired on more than 30 stations across South Carolina and neighboring states.

Our monthly video magazine program, "CUE" (Clemson University Extension), is produced totally inhouse and is delivered to 24 broadcast and cable stations in nine major markets from Atlanta to Wilmington and from Asheville to Savannah. Totalling the number of households in the area of dominant influence in the nine markets indicates that "CUE" Video Magazine is available in nearly three and one-half million homes in South Carolina and surrounding states. In addition, county Extension personnel use segments edited out of the program in their local programming efforts.

Following 1991-92's dramatic increase in video production output, and coupled with financial difficulties being experienced by Extension, we saw the production effort level off during 1992-93. In fact, just as last year, approximately 800 program units were completed, and the average output for the production studio was down from 4.5 to 3.4 program units per week. The classroom studio however, increased its average to 12 programs per week during the academic year including more than 500 hours of live telecampus programming. The Field Production unit remains steady at about seven program units per week.

In last year's report we saw a dramatic increase in the quantity and quality of our output as a result of the installation of the new equipment. We had anticipated another significant increase during 1992-93; however, financial difficulties experienced by the Cooperative Extension Service limited the number of new videoconferences we could produce; therefore, only a slight increase in output has been seen. We now are faced with a significantly downsized and streamlined Photo Services unit and with the prospect of producing video and multi-image programming without the benefit of an in-house art department. As we enter 1993-94, we are challenged to overcome these difficulties and to continue to provide an adequate level of service to our clientele.

Development Office

The Clemson Fund

The Clemson Fund, which has been in existence for just over a year, receives all private gifts from individuals (alumni, faculty, staff, friends and parents), corporations and philanthropic foundations to all areas of the University. These gifts can be restricted to annual operations, endowment or capital needs.

Last fiscal year for the first time, 10 separate annual fund drives were conducted: one for each of the nine colleges and the library. Solicitations included a combination of mail solicitations and phonathons with an annual gift club emphasis. These dollars will support faculty aid, student aid, University-wide programs and other current needs determined by the college deans.

Gifts to the endowment come from individuals, corporations and foundations and are used to establish new endowed programs or may be added to existing ones. Endowments support named restricted programs for faculty positions (chairs, professorships, lectureships), student aid programs (presidential scholars, named restricted scholarships) and other program endowments.

Capital gifts support new and existing buildings, class projects and equipment for new and existing laboratories.

Planned giving is being promoted aggressively to build the inventory to \$75 million by the end of 1997. A targeted prospect list of 6,000 has been developed. The Horizons mailers have been sent three times this year to this list, encouraging the support of Clemson's alumni through bequests, trusts and other planned giving instruments.

Primary Gifts Committee

The Primary Gifts Committee was established July 1, 1992, (to replace the Campaign Executive Committee) and was chaired in FY '92-93 by Warren H. Owen. The committee is staffed by the president, the vice president for institutional advancement, the associate vice president for development, the senior director of development and the president of the Foundation.

This year, for the first time, each of the nine colleges will select a person from its constituency to serve as its representative on this committee.

Goals for FY '93-94

A cash goal of \$18.5 million has been set for FY '94 along with a gifts and pledges goal of \$22 million.

This year the cash goals will not include individual and corporate gifts-in-kind. Gifts-in-kind will be solicited and encouraged with the same level of intensity as in the past, and they will be added to the year-end gift totals. These gifts are important to the University and provide equipment which otherwise would have to be purchased.

Summary for FY '92-93

Private gifts reached an all-time high of \$18,973,474.26, an increase of 10 percent in cash gifts when compared with the FY '92 total of \$17.1 million. Support from individual, corporate and foundation donors to all areas of the University continues to show encouraging growth.

The number of faculty and staff donors rose to 1,162 (up from 896 in 1991-92). They gave \$182,347 to support Clemson's academic programs.

Giving by all individuals including alumni, parents and others increased 43 percent. Individuals gave \$9,501,192.

Corporations and foundations gave \$9,472,282.

Membership in the annual major gift clubs increased in all clubs: Presidents Club — 1,212 (17 percent increase), Clemson Fellows — 92 (12 percent increase), The Founders — 174 (2 percent increase).

Planned giving is an important aspect of Clemson's fund-raising program. In FY '93, \$4,204,330 was received from deferred gifts from individuals. This figure represents 44 percent of the total cash received from individuals. During the year, \$9,820,482 was recorded in deferred gifts (\$7,390,000 — bequests, \$2,430,482 — trusts and insurance). The deferred gifts inventory totals \$37,887,194 as of June 30, 1993.

Major Individual Gifts

Alumni, parents, friends, faculty and staff made gifts of \$9,501,192 in cash or cash equivalents in FY '93. This total includes outright and matured deferred gifts. Trusts and life estates are recorded in the year in which they are irrevocably given. Gifts from individuals represent 43 percent of the total private support. These gifts support chairs, professorships, scholarships, fellowships, programmatic needs, the library and other special projects.

FY '93 Fund-raising Facts

- Ten individuals made six-figure gifts (\$100,000+) totaling \$4,459,439.30 and representing 47 percent of all individual gifts.
- The top 50 gifts (\$25,000+) totaled \$6,162,375.87. This figure represents 65 percent of all individual gifts in FY '93.

New Endowed and Annual Programs

For FY '93, 44 new endowed programs, eight new capital programs, and 23 new annual programs were established. When fully funded, the endowed programs will add approximately \$3,059,878 to the endowment of the Foundation, and the

capital projects will add approximately \$5,025,000. New annual programs will contribute \$69,830 to Clemson's academic mission. Ten agreements were written for existing funds as part of our effort to expedite the administration of these programs. Thirty-eight agreements are pending donor approval for completion.

Employee Matching Gift Programs Above \$10,000

Individuals have contributed, through corporate matching programs, a total of \$897,713.24 in FY '93. This represents 7 percent of the total \$9,501,192 given from individuals for the fiscal year. Funds from the top 12 corporate matching-gift companies totaled \$675,224.07 for the year.

Annual Giving

The Annual Giving area completed its first year of soliciting alumni by segmenting them within the college that granted their Clemson degree. These efforts proved to be more time consuming and slightly more expensive. However, increases were seen in the amount of the average alumni gift and phonathon pledge. The number of gifts from faculty and staff, parents and friends also increased, confirming the positive reaction reiterated by alumni that they enjoyed the promotion of and ability to designate gifts to specific areas of interest.

Facts on Gifts from Individual Donors

- 12,907 individual donors made 18,102 gifts. The average gift was \$525 in 1993; \$363 in 1992.
- 17 percent of Clemson alumni on record made gifts to Clemson's academic programs — a decrease from 21.4 percent in 1992.
- Gifts from parents increased 276 percent, with 288 gifts totaling \$191,734.75 in 1993 — up from 264 gifts totaling \$50,975 in 1992.
- Gifts from friends increased 213 percent, with 1,302 gifts totaling \$3,799,809.75 in 1993 — up from 1,290 gifts totaling \$1,214,691.44 in 1992.
- The number of gifts from faculty and staff increased 23 percent from 896 to 1,162. However, total gifts decreased 26 percent from \$245,602.44 to \$182,346.87.
- Gifts from all individuals increased 43 percent from \$6,659,991.47 to \$9,501,192.15.

New Donor Facts

New annual giving donors to the Clemson Fund numbered 2,397 in FY '93.

- Of the new donors, 154 were parents making their first gifts.
- Of 1,593 new alumni donors, 537 (34 percent) committed through the phonathon.
- The 1993 senior project attracted 661 (41 percent) of the first-time alumni donors.

These methods are developing into the most effective means of broadening Clemson's base of support.

Student Phonathon

The FY '93 student phonathon focused on two primary goals:

- To approach all alumni for gifts directed to their respective college.
- To increase the number of contacts made by reverting to a paper-driven environment until improved software could be written.

Major Gift Clubs and Donor Relations

During FY '93 the Donor Relations Office has managed the Major Gift Club and Society programs, provided stewardship reporting and services, promoted financial support of Clemson University, and provided recognition and personal attention to the University's major donors.

Of the 1992-93 Presidents Club membership, 277 are charter members, and 467 are renewal members from FY '92. Of the 1992-93 Clemson Fellows members, 13 are charter members, 19 elevated from Presidents Club and 31 maintained the Clemson Fellows level from FY '92. Of the 1992-93 Founders members, 52 are charter members, 12 elevated from Clemson Fellows, 10 elevated from Presidents Club, and 45 maintained The Founders level from FY '92.

Cumulative Gift Society Membership

The cumulative gift society levels are:

Benjamin Ryan Tillman Society	\$100,000 - 499,000
John C. Calhoun Society	\$500,000 - 999,000
Thomas Green Clemson Society	\$1,000,000 or more

Of the 1992-93 Calhoun Society members, one became a Clemson Society member in FY '93. There were seven new Tillman Society members and 24 new Benefactors of 1889 members.

Major Donor Relations Objectives Accomplished in 1992-93

- Produced, published and distributed 1992 annual Endowment Report.
- Provided mid-year status report on individual endowed funds to respective donors who established the fund and/or other individuals associated with the fund.
- Acknowledged all memorial gifts to the families of the deceased for whom gifts were made.
- Acknowledged to individuals who established endowed funds, all gifts designated to the respective fund from other donors.
- Responded to requests for information on individual funds, gift records, gift club status and other University matters.
- Acknowledged new gift club members, renewal members and those changing gift club level.
- Maintained current records in computer data base for each individual gift club member.
- Acknowledged occasions of major gift club members warranting personal attention.
- Provided major gift clubs hospitality suite in stadium for home football games.
- Initiated and attended to all details for personal acknowledgment by the University president of birthdays of society members.
- Major gift clubs annual dinner/campaign victory celebration, August 29, 1992.
- Breakfast for major gift club members of reunion classes June 13, 1993.
- Luncheon honoring Dr. Gil Robinson upon announcing the naming of the Ceramic Engineering Department in his honor.
- Initiated plans for donor recognition through Tribute Through Trees.
- Networked computer system with support staff.
- Implemented program for computerization of endowed funds information and began input of data.

Summary

Donor Relations has progressively become an integral area of fund raising by promoting and enhancing solicitation efforts in the Development Office. During FY '93 more than \$100,000 was received by the Donor Relations Office. In addition, more than \$11,000 was received as a result of the solicitation included in the 1992 Endowment Report. Receipts in excess of \$150,000 were received in major gift club membership renewals after June 8, when reminder letters were mailed to those who had not renewed their membership for FY '93. More than \$40,000 also was acknowledged in FY '93 for memorial contributions. In addition to the major gift clubs and society program and stewardship services program management, general duties continue to increase as donors contact this office for assistance with general University matters.

Special Projects

Requests for special projects operated by the annual giving staff continued to increase with the University-wide budget decreases and the increased awareness of restricted giving opportunities through the new college-targeted approach for annual gifts. A close affiliation with student organizations also provided opportunities for smaller targeted projects.

Examples of current special projects are the Parents' Council solicitations, Classified Staff Scholarship, Library Friends Centennial solicitations, student clubs and reunion class projects.

Planned Giving

Bequests

Included within this category are 16 new gifts designated to the Foundation through wills and as beneficiary of Corporate Director's Life Insurance Endowment Plans. These break down as follows:

2 Corporate Director's Endowment Plan	\$300,000
14 Bequests	\$7,090,000

Life Insurance

This category accounts for gifts designating the Foundation as owner and beneficiary of the policy. One new gift was received totaling \$1 million.

Proposal Activity

- On the average, 70 percent of proposals delivered by the Office for Development are funded. However, the confirmed gift is only 60 percent of the "ask."
- Proposal deliveries have increased significantly since 1988 when only 33 proposals were delivered. During the 1992-93 year, 170 proposals were delivered, representing a 415 percent increase in the five-year period.
- Proposal deliveries increased by 87 percent from the previous year to the current 1992-93 year.
- Of the 170 proposals delivered this year, 88 have been acted upon by confirmation or denial as of July 1, 1993. Only 18 percent of the proposals have been denied.
- The F.W. Olin \$5 million proposal for the renovation of Olin Hall was the largest delivered proposal made during the year.

Corporate Support

In 1992-93 gifts from corporations totaled \$5,694,236, decreasing 18 percent from the previous year. However, cash contributions showed a strong increase of 44 percent and totaled \$1,408,674. The decrease occurred with gifts-in-kind. These

non-cash gifts of equipment, a large segment of which has been computer related, did not develop as in the previous years.

During the year new relationships were initiated or strengthened with several of this country's largest and best-known companies. These relationships will be important dividends to Clemson in the future.

Leading companies are tying their support of universities more closely than ever to their business and technical interests. Clemson is responsive to these trends and to the fact that these kinds of partnerships are among the most effective ways for land-grant universities to carry out their missions.

Foundation Support

- Gifts from foundations and associations increased 7 percent when compared with the previous year, from \$3,527,331 to \$3,778,045.
- The number of foundations making gifts increased by 16 for a total of 81 gifts.
- The total number of gifts from foundations and associations increased by 11 percent from 314 donors to 348 donors.
- Association totals increased by 84 percent, while foundation totals were down by 5 percent.
- Visits to 11 national foundations were made: Hearst, Pew Charitable Trusts, Kellogg, Whitaker, Post, Keck, Jameson, Josiah Macy, Abney, Lettie Pate Whitehead and F. W. Olin. Campus visits by foundation program officers were made by Kellogg and Hearst.

Assistant Vice President for Development

Our mission during FY '93 was to manage the daily administrative operations of the Office for Development in a manner that allowed all divisions to successfully fulfill their fund-raising responsibilities without being consumed by administrative detail. We also strived to give the staff the assurance that its support structure, supplies and equipment always were available and ready to serve. We continued to supervise and maintain, as well as identify and utilize, new methods and technologies in the areas of donor research, information management, computer programming, data base management, proposal and foundation management, and computer applications. In addition, we provided administrative support to the Foundation.

Administration

We continued to provide quality administrative support for the Office for Development, both for central and college development officers. Below are highlights for FY '93:

- Three new personal computers were purchased to replace those systems which had become outdated. Two laptop computers and a portable printer also are available for overnight check out and travel needs.
- Documentation manuals for several areas including dBase reports, personnel procedures, student work programs and computer reporting were updated and expanded. Cross training of employees for various position responsibilities and duties was continued throughout the year.
- To maximize the use of budgetary funds for postage, the Office for Development implemented a postage log system. This system will determine if the purchase of a postage meter to handle mail for the Foundation building is valid.
- The Project Leader Program was evaluated and reorganized. The support associates determined that having a revolving project leader on a monthly basis was inefficient. In an effort to equally distribute the workload among support associates, individuals volunteered for various duties, and the Social Committee and Professional Development Committee were formed.

- In the fourth quarter, the administrative specialist C position which supports the development efforts of the College of Liberal Arts and the College of Commerce and Industry was filled with a minority candidate through the efforts of a peer committee, thus furthering our commitment to the use of team efforts in making departmental decisions.
- The public information specialist I position which supports the Office of Donor Research and the Office for Foundation Development and Proposal Management became available late in the fourth quarter. This position will be filled with a temporary support associate until we analyze the most efficient way of distributing responsibilities.
- The student work-study program was analyzed and streamlined to save costs and to maximize efficiency. Students were hired on a work/study basis exclusively, thus allowing for a minimum hourly cost of 30 cents on the dollar.
- Utilization of electronic mail services for routine and internal correspondence and communications was implemented in an effort to diminish paperwork.
- The University electronic leave system was implemented to gain efficiency and eliminate unnecessary delays in routing leave requests.
- The purchase of all supplies was centralized to reduce costs and eliminate waste.
- Maintenance contracts for existing equipment were evaluated, and \$7,500 in contract expenditures was eliminated. This savings will be used to upgrade and purchase new equipment.

Clemson University Foundation

- The Foundation held four meetings around the state in August, November, February and May.
- Minimizing costs and appraising quality remained priorities for FY '93. The information package for each meeting was enhanced and is now presented as a color-coordinated and bound publication.
- Expenditures were monitored closely during FY '92-93, and approximately \$2,500 was saved in meeting costs.
- In an effort to maximize interaction and awareness of individual college activities, a college presentation program for each meeting was implemented. In addition, the deans' council representative also makes a summary presentation of academic activities at each meeting.
- The Primary Gifts Committee now meets in conjunction with the quarterly Foundation meetings to better utilize the time and schedules of our volunteers and Foundation directors.
- A plaque that lists all Foundation presidents since 1933 was purchased. This plaque will be displayed permanently and prominently in the Foundation headquarters.

Information Management

1992-93 was a pivotal year for Information Management. The department continued to provide quality service while constantly searching for ways to streamline and to maximize efficiency in serving our constituencies. Below are highlights of the year:

- Due to programmatic difficulties, implementation of the new relational data base was postponed a second time until October 1993. The new system was made available to users in a test mode. Conversion tests were performed to identify errors within the system, and corrections were made accordingly. Our programmer/analyst continues to serve as an on-site liaison between the Office for Development and DAPS.

- The data coordinator continued to utilize dBase programs to manipulate and facilitate short-term information needs. Nineteen active dBase programs are now in use. Training sessions now are offered to support associates to enhance their skills and to maximize cross training of systems.
- Response time in computer programming requests continued to decrease throughout the year through cross training and coordination of the data coordinator and computer programmer.
- Partnerships with other departments were continued to streamline data access from the mainframe and eliminate duplicate mailing and retrieval processes.
- The assistant vice president for development continued to serve as a member of the University Computer Administrative Advisory Committee and also serves on an Information Management Committee that meets monthly to discuss University needs regarding new opportunities provided by the constantly changing technology of information management.
- The Prospect Tracking System was expanded and improved to coordinate all fund-raising activities. We also enhanced our prospect assignment program, which will help us monitor development activities with assigned prospects in a systematic and orderly fashion.
- Existing and successful programs at other U.S. colleges have been researched and examined extensively to identify the elements of prospect screening most appropriate for Clemson's constituency.
- A collaboration with the Alumni and Annual Giving offices allowed for the development of a strategic plan to contact approximately 1,700 of the 8,900 former Clemson students with "XX" status. Current addresses for these individuals were purchased, and a special communication will be sent to them in August 1993 from the Alumni Office.
- To streamline data processing, the *President's Letter* data base was dissolved. All individuals were coded in the mainframe, and Information Management now is responsible for maintaining this information on a permanent basis.

Data Entry Department

- The number of lost alumni and friends continued to decrease throughout the year. As of 6/30/93, there were 4,615 lost alumni, representing a 48 percent decrease when compared with the 8,935 lost alumni addresses on 7/14/92. The decrease can be attributed to the aggressive research conducted by the Data Entry Department prior to denoting in the mainframe an alumnus as lost. Also, an electronic search for our lost alumni was conducted by TransUnion in August 1992. There was a second TransUnion download on 7/1/93.
- The Data Entry Department designed and implemented a tracer card to be mailed to the tracer addresses to further decrease our number of lost alumni. In May 1993, 1,638 cards were mailed, and as a result, 303 additional addresses have been obtained.
- New information update forms were designed and distributed to development officers and support staff to further our continual efforts in gathering and maintaining the most current and valid information on our constituents in the mainframe.
- To ensure accuracy of information on an alumnus' or a friend's death, the Data Entry Department standardized a letter which is mailed to the deceased's family for verification. This letter has been instrumental in furthering our commitment in the flow of accurate information to *Clemson World News*.
- In the fourth quarter, the Data Entry Department analyzed survey results from Harris Publishing to verify alumni information. The Harris survey

results will be downloaded into the mainframe within the first month of FY '94.

- The Data Entry Department continued to provide support to the Alumni Center and the Office for Annual Giving in the preparation of bulk mailers. Approximately 70 mailers representing 108,615 pieces (3rd class, 1st class and non-profit mail) were prepared in FY '93.

Computer Programming/Data Coordination Department

- To reduce paper flow, ensure accuracy and maximize efficiency, the entire report request process was evaluated and revised. All report output was proofed online before printing, and Culprit reports were standardized and modified to run more efficiently and use less computer time. All programs written in FY '93 were downloaded onto a floppy disk to allow for instant retrieval and regeneration if necessary, thus preventing the need for rewriting reports if an error is detected. A report log also was implemented to monitor the need and use of all report requests.
- Master key assignments were implemented to allow Social Security numbers of alumni and friends to be confidential. Constituents also may be accessed by their IPTAY number if available.
- Error reports to alert the Data Entry Department of possible glitches from downloads (Harris, TransUnion) were designed and implemented, thus allowing for greater accuracy and efficiency.
- To meet the demands of donors wanting anonymity, a program was designed to ensure the denotation of "anonymous" on several reports.
- Approximately 35-45 Culprit reports were run every week of FY '93 in conjunction with 10-15 standard Report Writer requests per day.
- Standard phonathon reports were written, and access to these reports was given to the Annual Giving Office to allow for more efficient retrieval of phonathon results.
- A program to electronically produce gift acknowledgments for the Development system was designed and implemented in June 1993.
- In anticipation of the new relational data base, the SQL programming techniques were implemented.
- A total of 153 reports were written and delivered for a successful year-end close out for FY '93.

Donor Research Department

- The highest priority of the Office of Donor Research for FY '93 was the formation of a suspect data base for development efforts during upcoming years and future capital campaigns. At this writing, this data base has approximately 1,400 potential donors who were analyzed on capability and inclination. Suspects were obtained from various miscellaneous sources including existing research files and those with indicative demographic and geodemographic data. We also purchased lists of wealth holders in the state as well as nationwide; these lists were cross referenced with our alumni data base to determine matches. The resulting names were added to the suspect data base.
- During the third quarter a presidential questionnaire was mailed to key Clemson volunteers (advisory and development councils, board of visitors, board of trustees) to request their assistance and to maximize the number of development opportunities. The results also are housed in the suspect data base.
- An alumni reunion questionnaire was written and approved to ensure that the mainframe contains the most up-to-date information. The surveys were distributed during the 1993 reunion weekend.

- The Office of Donor Research continued to provide necessary research to development officers and various faculty/staff members on a timely basis. Efficiency in field research and in the compilation of profiles was greatly increased with the positions of the public information specialist I and a presidential intern. One hundred and fifty research profiles were completed during the year as follows: preliminary — 128, individual — 10, corporate — 5 and foundation — 7.
- A thorough investigation and feasibility study of an electronic filing system were conducted with the intent of increased efficiency in file storage and retrieval as well as a savings in office space. A space saver filing system was analyzed in FY '92; this system was not feasible because of the cost of structural adjustments needed to support the system. With the guidance and supervision of the assistant vice president for development, several electronic storage systems (Fujitsu, IBM, Optika) were analyzed to determine which system best would fit our needs. Because of the need for performance credits for upcoming fiscal years, the project has been postponed until further notice.
- In the fourth quarter, MicroVisions, a geodemographic segmentation system based on the zip+four, was purchased to further identify constituency opportunities at the household level for 25,000 constituents. This information includes financial indicators from Equifax, Inc. The data was appended to our mainframe in June 1993.
- The Office of Donor Research also began writing proposals in the second quarter on an as-needed basis in an attempt to increase the number of proposals delivered. The director worked closely with the director of foundation development and proposal management on a proposal to the Whitaker Foundation for the Department of Bioengineering.
- Another accomplishment of the Research Center was the geographic clustering of major donor prospects to allow for greater efficiency in development officers' travel budgets. This program was suggested by the assistant vice president for development, and reports were programmed to group alumni by city, state and Clemson Club to allow contact with a maximum of potential donors in a specific area. Development officers are continuing to utilize this capability.

Gift and Asset Management

Gift Processing and Reporting

The primary focus of this group continues to be centered on timeliness, accuracy and efficiency in daily gift receipting and depositing as well as refining financial and audit controls. Programming and testing of the updated gift system are continuing. Additional efficiencies should be provided during the year as the updated data base system is fully implemented. Staff expertise in related computer applications such as payroll deductions, spreadsheet and grid preparations, and matching gift tracking also have increased gift processing and reporting efficiencies.

Gift deposits to operating and endowment accounts are being distributed to departments and colleges on a weekly and monthly basis.

Financial Analysis and Planning

Comparative gift reporting by college, department, use and year, as well as pledge information by college and year, have been refined to aid colleges and development officers in financial analysis and planning. Gift segmentation figures, fund-raising cost, endowment management and Real Estate Foundation information are highlighted below and presented in detail elsewhere in this report.

- Efficiency in gift processing continued as gift income rose an additional 10 percent in FY '92-93. Previous annual increases for the past five years are 6

percent, 11 percent, 16 percent, 21 percent and 40 percent, respectively. The total of private gifts for the year ending June 30, 1993, was \$18,973,474. This figure represents 19,183 gifts, which averaged \$989 per gift.

- The cost to raise these funds remained well-below national standards. Specifically, the cost to raise private dollars at Clemson in 1992-93 was 10.39 cents per dollar. The NACUBO Benchmark Survey of 1992 indicates the median for 94 universities surveyed is 16 cents.
- The Clemson University/Clemson University Foundation combined endowments rose to an estimated \$75 million, up 12.6 percent from the previous year's total of \$66.6 million.
- Investment performance for the Foundation-managed endowment pool earned 10.28 percent for FY '92-93. This represents a 12.75 percent return on equities, a 12.27 percent return on fixed income investments, and a 3.42 percent return on cash and equivalents. Over the past five years, the Foundation's managed pool returned an annualized rate of 14.84 percent per year.
- The Investment Committee reviewed all fund managers during the year and set an annual schedule for their visits. The commission recapture program, whereby brokerage fees can be refunded to the Foundation, has netted \$24,132 this fiscal year. The asset allocation policy is being reviewed to project risk/returns on management styles and to evaluate adding additional managers. The endowment spending policy was revised to approve assessing an internal management fee of .6 percent effective 07/01/93.

Real Estate Foundation

- The Clemson University Real Estate Foundation, established in 1990-91 as an independent 501(c)(3) not-for-profit public charity, received five parcels of real estate totaling \$365,532 during 1992-93. In addition, the Real Estate Foundation sold eight parcels for a total of \$567,833. The Real Estate Foundation serves as an affiliated organization of Clemson University and the Clemson University Foundation and seeks to advance the University by providing an efficient conduit through which gifts of real estate and property are received and liquidated.

Endowment Management

The managed endowment pool in the Foundation experienced endowment growth as a result of new gifts and investment strategies. The managed pool was estimated to be \$58.1 million on June 30, 1993, up from \$50.5 million one year ago. The managed pool experienced a combined return of 10.28 percent for the 12 months ending June 30, 1993, including a return of 12.75 percent on equities, a 12.27 percent return on fixed income investments, and a 3.42 percent return on cash equivalents. This return was recorded in a year in which the Standard & Poor's 500 Index rose 13.58 percent, the Russell 2000 returned 13.46 percent, the Lehman Brothers Governmental/Corporate Bond Index returned 13.15 percent, and the Consumer Price Index (inflation) rose 2.82 percent.

The return on the Foundation's pool managed endowment placed it in the lower quartile of managed funds with a 65 percent equity/35 percent fixed income asset mix for the past year. However, the pool ranks in the top decile for the past five years and has returned an annualized rate of 14.84 percent per year during that period. The median return of the referenced fund (65/35 mix) was 13.65 percent for the year ending June 30, 1993, while the five-year return is 12.77 percent.

The Foundation's total pooled assets also include Foundation-managed annuities and life income funds, as well as other income and non-income-producing assets, principally in short-term instruments and real estate. Clemson University and the state treasurer hold additional endowment assets estimated to be \$16.9 million.

These combined endowments held an estimated market value of \$75 million on June 30, 1993, up from \$66.6 million in 1992.

Contributions Allocated to Fund Managers FY 1992-93

Total endowment fund balances are evaluated at the end of each quarter and adjustments to the 65 percent equities/35 percent fixed income portfolio ratios are made as transfers are completed. In addition, equities are evaluated and/or rebalanced between growth and value management at least semiannually.

Constituent Relations

In May 1993 an overall reorganization of Institutional Advancement resulted in Alumni Relations, Historic Houses and Visitor Programs joining to form the Department of Constituent Relations. Following are the '92-93 annual reports for these units.

Alumni Relations

In 1992-93 the Alumni Relations program focused on increasing involvement through constituency efforts, surveying "customers" to determine expectations of the alumni program, and increasing lines of communication between the alumni office and volunteers.

The following outlines the accomplishments of the past year by department:

Office of Associate Vice President

- Work continued on the Alumni Association strategic plan with the adoption of a new format. Customer surveying was completed through phone calls, printed mail-back questionnaires and focus groups. Numerous trends were identified and presented to the Alumni National Council. Information gathered has been incorporated into the strategic plan for approval.
- An architect for the new University Visitors Center was chosen, and key messages for the center identified.
- The Clemson Alumni Office had an active role in the CASE District III conference, and 1992-93 saw numerous mentions of Clemson alumni programs in the *CURRENTS* magazine published by CASE.
- A naming guideline policy for college alumni groups was adopted.
- Academic/educational programs were presented to alumni through Clemson Clubs, meals programs and the Alumni National Council.
- Special programming was developed to give the president an opportunity to meet with key alumni groups across the state to address major public relations issues.
- Four Alumni National Council meetings were held, including a strategic planning retreat.
- All aspects of the campaign victory celebration event and committee were successfully managed.
- Participated in the Institutional Advancement reorganization evaluation and accomplished the merger of several departments within the division.
- Two quality service training sessions were held for staff, along with a public speaking seminar.
- The credit card contract was revised, offering customers several new options. A commitment to increased marketing on the part of SCN was secured, and the customer base was increased significantly.
- Criteria for the selection of all significant University and Alumni Association awards were rewritten, updated and approved by the board of trustees.
- Efforts to re-design the postcard mailer were completed, which will result in significant postal savings.

- Staff planning and evaluation sessions were held for each major alumni event.
- Information on the Clemson Fund and Clemson Golf Course were provided at all alumni functions.
- An alternative to the senior picnic was held with only marginal success.
- Successful partnerships with the College of Agricultural Sciences and the College of Nursing were continued.
- Actively involved in the University Public Relations Committee and the S.C. Alumni Association Directors group.

Office of the Assistant Vice President of Alumni Relations

Alumni Outreach

- Coordinated 11 University programs for alumni and friends through community meal clubs:
 - Four meetings in Charleston — Approximately 80 people attended each meeting.
 - Three in Greenville — Approximately 60 people attended each meeting.
 - Four in Columbia — Approximately 50 people attended each meeting. One program involved great interaction with USC representatives to coordinate a joint presentation by the president of Clemson and the president of USC..
- Worked closely with Tom Skelton to support the College of Agricultural Sciences alumni organization. Attended meetings of the board of directors; provided financial support for mailing of agricultural newsletter; attended local district meeting of agricultural alumni.
- Worked closely with Pat Padgett to support the Clemson Alumni Nursing Society. Co-sponsored the annual College of Nursing Alumni of Merit banquet. Forty people attended, and three alumni of merit were recognized.
- Fostering discussions with representatives of the College of Education to outline an academically oriented recruiting program. The goal: development of a simple program to enable alumni to provide the names of potential students to Clemson and to provide Clemson information to potential students.
- Continued meeting with representatives of each college through the College Alumni Relations Board. Discussions encouraged exchange of ideas and awareness of Alumni Association efforts.
- Continued involvement with alumni programs through Clemson's Career Center. Accepted the production and processing tasks of the revised placement bulletin, "Job Trakker," and initiated a thorough evaluation of electronic resume placement firms to offer greater career assistance to alumni.
- Corporate contacts: In conjunction with Bob Fuzy, visited Burlington Industries officials to discuss communications between Clemson alumni/Burlington employees. Presentation topics were discussed. Communications continue with Ken Nettles of SCE&G to develop a community service project for SCE&G employees/Clemson alumni that will aid communities while recognizing Clemson's strengths. Duke Power representatives continue to consider Duke Power employee/Clemson alumni programs of interest.

Community Outreach

- Served as chair of Clemson Chamber of Commerce committee on community development and University relations. Served on planning committee for Clemson Area Leadership Program. Alumni Association provided finan-

cial support for newcomers' reception and door prizes for various Chamber events.

- Was jailed in support of Muscular Dystrophy's jailathon; project raised more than \$12,500.

Campus Outreach

- Supported efforts of college representatives coordinating alumni events. Primary areas of effort: Agricultural Sciences' alumni organization and Nursing's annual alumni banquet.
- Aided University Conference and Guest Services Office by serving as University spokesman to several Elderhostel groups.
- Served as member of senior studies board for Conference and Guest Services.
- Served on University committee seeking expanded financial support for student groups participating in homecoming events.
- Served on board of directors for University's United Way Campaign.
- Supplied Alumni Association items to support various organizations: Pickens County Police Officers' Golf Tournament, Professional Secretaries International, College of Education's CU Teacher Incentive Program.

Office of Field Activities

Clemson Club Programs

Clemson Club Programs included fall and spring club meetings, luncheon and breakfast meetings, family barbecues, golf tournaments, club organizational and re-organizational meetings, regional leadership meetings, and a Club Presidents' Appreciation Weekend.

- A Washington, D.C./Baltimore regional board of directors was established to coordinate and provide guidance to the Clemson Clubs and young alumni groups in these two areas. Twenty key alumni in the region were identified by the Institutional Advancement staff and asked to serve an initial two-year term. Joe Blandford of Maryland was elected chairman.
- The second annual Clemson Club President's Appreciation Weekend was held November 6-7. Forty-eight attendees representing 24 clubs were entertained at a reception Friday night and in the president's box for lunch on Saturday. Each president also received a certificate of appreciation.
- Leadership Clemson 1993 was held the weekend of February 12-13. An expanded format was designed by the alumni staff to target all volunteers of the Alumni Association. A television theme was devised and used successfully throughout every aspect of programming, from the registration brochures to the breakout sessions.
- Chartered clubs have increased from 45 to 51. Fifty-five percent of Clemson Clubs now are chartered, and 81 percent of the S.C. Clemson Clubs are chartered.
- Two Clemson Club newsletters for club leaders were designed inhouse and distributed to all club presidents.
- The CASE award-winning *Clemson Club Menu* describing the speakers and programs offered by the Alumni Association was updated and distributed. Clubs continued to take advantage of its offerings.

Young Alumni (YA)

- The YA Council held meetings in July, September and February with strong participation.

- The fifth “Young Alumnus of the Year” award was presented to Brian O’Rourke of Greenville.
- Young Alumni participated in eight high school receptions held in Georgia and the Carolinas.
- The third annual Young Alumni Appreciation Day was held September 12 with great success. A total of 104 representatives and guests attended a pregame barbecue, and 22 attended the Saturday meeting and had lunch in the president’s box.
- Young Alumni hosted more than 150 happy hours, TV viewing parties, bowl game parties, barbecues, oyster roasts, harbor cruises, lake parties and community service projects.
- Fifty-nine Thomas Green Clemson awards were presented to outstanding graduating high school students in the Carolinas and Georgia.
- One Young Alumni newsletter was published, informing young alumni of upcoming activities, advertising YA trips, updating the Young Alumni Memorial Endowment and listing area YA representatives. The fall newsletter was given to graduating seniors as they came by the Alumni Center to pick up their senior gift.
- There are 54 YA representatives on the Young Alumni Council.
- The second annual Young Alumni Fourth of July Weekend at Hilton Head was held. Events included a cruise, welcome social and a Young Alumni Council meeting. Eighty-five young alumni attended.
- A Young Alumni Memorial Endowment is fully endowed and now memorializes 12 young alumni of Clemson University. The total now stands at \$6,551.

Office of Director of Constituency Programs

Women’s Council

- Membership currently is stable at 3,500 alumnae, friends and student members. These members represent 41 states.
- The Women’s Council advisory board met twice, with the executive committee meeting on two additional occasions to work on strategic planning and evaluation of activities and progress. The advisory board has concentrated on the committee structure to improve communications and encourage volunteer involvement.
- The advisory board continues to implement an action plan that will focus on offering services and activities that are unique and creative and, most importantly, not offered by other outside interest groups. This complies with our overall Alumni Relations goal to question as we plan events — “What’s in it for our alumni audience?” — and to remember that “free time” is obsolete.
- Women’s Council planned receptions in the homes of advisory board members. We received overwhelmingly positive feedback about these receptions. The format was social networking, an alumni message with an emphasis on private support and an appeal to be visible as female volunteers for Clemson University. Some areas invited speakers from the community to speak on issues such as safety for women.
- The first Women’s Council newsletter, *Women on the Move*, was compiled and mailed to all members. We have received extremely positive feedback from this effort.

Parents’ Council

- The advisory board met twice. Two additional meetings were held for the executive committee to assess progress, evaluate activities and continue to set goals for the future development of the Parents’ Council.

- The Parents' Council advisory board approved the decision to move the Parents' Council under the supervision of Student Affairs. This transition will take place during the next year. Alumni Relations will continue to fund the Parents' Council.
- Parents' Council advisory board played a major role in nine summer orientation sessions.
- Parents' Weekend was a tremendous success; more than 1,500 parents registered; records indicated that 67 percent of those in attendance were parents of freshman students.

Student Alumni Council (SAC)

- Held an effective officer retreat in January at Sapphire Valley; discussed goals for the year with new officers and revised constitution.
- All committee chairs and officers evaluated each event sponsored. This process encourages new approaches and eliminates ineffective programs.
- A graduate assistant was hired to serve as graduate adviser for the Student Alumni Council. This provides excellent resources and a strong focus on SAC programs.

Continued sponsorship of the following annual programs:

- Welcome Back Festival '92 — 45 merchants participated in the largest festival ever (8,000-10,000 estimated attendance).
- Attendance at both national and regional SAA/SF conferences; presentations were made at national and regional conference on Welcome Back Festival. As adviser, Cindy Howard serves on the Strategic Planning Committee for the Region Three SAA/SF.
- Membership drive attracted about 80 students to fill 15 vacant positions. Improved membership selection process with strong adviser participation to assure positive customer/student relations; encouraged diversity in selection process.
- Senior Band Party — approximately 250 attended. This format replaced former senior picnic in which liability with alcohol consumption was great.
- Good Stuff Boxes — distributed on campus in key areas (library, Harcombe, Schilleter) to better access students. This program met great success this year.
- Alumni Master Teacher Award presented to Dr. Bill Lasser, Department of Political Science.
- SAC spring banquet — held on penthouse deck; guest speaker, Debbie DuBose. Special recognition went to Lance Burnett, Member of the Year, and Mike Dowling, Rookie of the Year.
- Senior Gift — continued sponsorship is a joint effort between the Development Office and SAC; very successful this year with 41 percent of seniors participating; involvement of SAC was improved.

Clemson Black Alumni Council (CBAC)

- Sponsored a successful homecoming reception in the major gift club box following the game. Approximately 100 attended. Black faculty, staff and alumni were invited.
- Held a CBAC planning meeting in August to focus on the upcoming year and make plans. Campus administrators were invited to share ideas and add cohesion to this constituency. Minority student leaders also attended. Number invited, 35; number attended, 6; response rate, 17 percent.
- All black alumni received two copies of *The Connection*, a newsletter compiled by the Minority Ombudsman Office in Student Development. Every at-

tempt has been and will continue to be made to share any information of particular interest to black alumni and to work with black faculty/staff to combine total resources and offer the best possible programs.

- CBAC sponsored a road trip to the Maryland game November 13-14. Approximately 50 people attended a reception held after the game.

Director of Special Events

The Office of Special Events managed 152 special events for Alumni Relations and other areas of Institutional Advancement. These included annual reunion activities for which the following was achieved:

- Developed and managed reunion program to increase alumni involvement and 50th class volunteer involvement.
- Organized the program and scheduled events for the weekend. More than 700 people attended all or part of the reunion program, the largest attendance in recent years.
- Offered new activities for the reunion class members that were well received.
- Produced a reunion manual for the class officers' fall planning session to prepare for reunion activities.
- Developed and produced a program for 125 of the 50th class members who were inducted into the Golden Tiger Society. Individual pictures were made of the class members receiving Golden Tiger certificates and Golden Tiger pins with the University president and the tiger mascot.
- Funded the production of a video recapping the experiences of Class of '43 members.
- Worked with the Development Office to assist in coordination of class projects and to combine mailers to generate private support for class projects.
- Coordinated the Carillon Garden dedication ceremony. The 50th class raised \$350,000 to fund the Carillon Garden.

Office of Alumni Marketing

Administrative

- Planned and moderated three Marketing Advisory Committee meetings.
- Created detailed statistical reports for the Alumni National Council and the Marketing Advisory Committee.
- Hired and trained the first marketing administrative support person.
- Computerized all marketing accounting and inventory records.
- Coordinated with Harris Publishing Co. to provide a directory for the College of Nursing's silver jubilee, resulting in a substantial savings for the college.
- Served as a marketing consultant to the Department of Electrical and Computer Engineering to re-design marketing materials and create a marketing plan for their annual seminar.

Credit Card

With an income of \$196,314, the credit card program ended the fiscal year with the highest annual revenue total in its five-year history. A renegotiated contract which offered several choices to customers, plus a strong marketing program, added more than 2,000 credit card customers for a total of 13,422 accounts. December and June produced the highest monthly income ever for those two months. The cumulative total income for the life of the program as of June 30 is \$923,129.

License Tag

License tag sales for '92-93 totaled 2,439 and produced revenue of \$52,860 for the Clemson Scholars program. June '93 was the best month in the history of the program with sales of 391 tags and revenue of \$7,820. Total cumulative tag sales now stands at 4,748, with total revenue at \$82,199.

Marketing of the tag was limited to promotion at Clemson Club meetings and alumni events, plus an advertisement in the football program.

Long-Distance Telephone Program

After telemarketing in the spring of 1992, more than 1,700 customers were added to the long-distance service. Through June '93, the program had generated \$68,256.59 in royalties. This amount was used to reduce the marketing debt, which will be repaid by the spring of 1994. Average monthly income from this program is \$5,700.

Insurance

The comprehensive medical insurance program has offered service this year to 827 temporary major medical clients, 38 major medical and two supplemental insurance customers. Life insurance coverage is being provided to 539 Clemson alumni and friends. Income from the insurance program generated revenue of \$4,140.71.

CollegeSure CD

During the fiscal year income from the college savings program totaled \$1,950.33. An advertisement for the program appeared in the spring 1993 *Clemson World News*.

Merchandise

Two new items, the 1992 Christmas ornament and an alumni centennial series print, were highly successful pieces of merchandise during the fiscal year, with ornament sales bringing in \$4,000 and the print \$3,000. In addition, income from the sale of watches, rings and other merchandise generated revenue of \$11,500.

Alumni Directory

The 1993 directory is scheduled for a mid-September delivery date. Clemson alumni responding to the questionnaires numbered 43 percent, a better-than-average rate. Sales of the directory stand at approximately 5,000 for an income to the Alumni Association of \$20,000.

Passport Travel

The travel program served 132 passengers on 10 trips in 1992-93. Income for the year totaled \$26,904.99. Expenditures surpassed income by \$21,339. A travel reception in October was held to preview the year's trips, and a brochure was mailed to a targeted list of alumni and friends. Evaluations were sent to every traveler, and improvements were made according to suggestions.

Alumni Surveys

The marketing office assisted in compiling, mailing and evaluating survey information from Clemson alumni. Individuals were asked questions about alumni programming through mailed questionnaires, by phone, a *Clemson World* magazine survey and focus groups. The data will be used for planning alumni programming.

Visitors Center

The Visitors Center focused on improvement of existing services and progressive involvement with the Class of '44 Visitors Center project.

The year's results are as follows:

Programs for External Audiences

- Served 24,566 walk-in visitors — 2,100 more than last year. This was the busiest year in the history of the Visitors Center.
- Arranged 294 school and community constituency group tours for 11,325 people. This includes the successful Agricultural Field Day held at the T. Ed Garrison Livestock Arena.
- Developed and conducted 133 special University research tours for 2,234 conference participants.
- In cooperation with Class of '44 and University personnel, helped select architectural firm for new Visitors Center and remained involved with class project.
- Continued to redefine focus and priorities of new Visitors Center by collaborating with Visitors Center Task Force.
- Established partnership with University's Marketing Department in planning for new Visitors Center by utilizing two MBA classes. Marketing plans were submitted for prospective students and potential retirees to the area.
- Established ties with University's Department of Parks, Recreation and Tourism Management for graduate student assistance in developing a long-range marketing program for new Visitors Center.
- Continued to improve communication capabilities and data management by acquisition of second computer.
- Distributed 3,857 copies of *Facts* publication to off-campus clients and 8,807 copies to walk-in visitors; distributed 10,705 brochures to off-campus clients.
- Responded by letter to 96 inquiries about the University and the Clemson area.
- Visitors Center highlighted on "The Ken Hatfield Show," September 13, 1992.
- Article on Visitors Center featured in College Choice spring 1992 newsletter; three tour guides interviewed for 1993 College Choice handbook.
- Continued assistant director's involvement in FOCUS:SC educational experience for new faculty and permanent staff.
- Represented the Visitors Center on board of directors and served as vice chairman of tourism committee for the Clemson Chamber of Commerce.
- Continued on board of directors of national university visitors center organization.
- Continued on board of directors of Greater Greenville Convention and Visitors Bureau.
- Instrumental in developing Clemson Events, Inc., the city/University festival organization.
- Participated in S.C. Governor's Conference on Tourism and Travel.
- Conducted orientation sessions on Visitors Center and University for state welcome center new personnel.
- Continued involvement in alumni constituency programs, reunion weekend, parents' weekend and president's box, as well as other special conference and University programs such as faculty/staff orientation, board of visitors, president's advisory council, town and gown, and Elderhostel.
- Updated AUTOMAP program for directional inquiries from visitors.
- Continued operation of University's 24-hour information line (656-INFO), including Clemson city events. There were 1,391 calls in '92-93.

Programs for Internal Audiences

- Identified 2,672 potential prospective students who participated in the campus tour program.
- Continued to market University programs — Alumni Association, Athletics and S.C. Botanical Garden — through displays.
- Continued participation in each monthly training session for new employees to introduce them to the history, mission and services of the University.
- Distributed 7,336 copies of *Facts* to on-campus users and sold 429 University information packets to departments on campus.

University Guide Service Program

- Prospective student guided tours: 474 for 5,561 people.
- Continued to expand tour guide master list in planning for an alumni organization and dedication of new Visitors Center.
- Tour guides delivered oral presentations about student life at every Clemson high school academic recruiting meeting this year sponsored by the Alumni Association.
- Improved tour guide training program.
- Added a graduate student assistantship to restructure, improve and supervise tour guide program and help conduct programs of office.
- Continued director's instructional assistance as visiting instructor in the College of Education and Visitors Center staff mandatory enrollment in History 100.
- Guide association took formal steps toward recognition as a University organization and elected officers who now manage much of the activities.

Historic Houses

Mission

The mission of the Historic Houses Department is to present the University historic houses and properties in a posture that will foster a public understanding of the origins of Clemson University within the context of the rich heritage of the state and nation. The historic houses are interpreted as an interdisciplinary approach coordinated with various University colleges and nationwide historic preservation resources.

During the past year we:

- Opened the John C. Calhoun House Museum to the public 361 days; more than 28,000 visitors toured the house and grounds.
- Opened the Hanover House Museum to the public every weekend, during special events, by appointment, and during the summer school sessions.
- Reappointed the Historic Houses Advisory Committee chaired by Michael Kohl and composed of 14 faculty, deans and administrators from several University departments and two community members.
- Received contributions of time, talent and money from more than 75 volunteers from the Lake & Hills Garden Club and the Clemson University Horticulture Club for the holiday celebration at both house museums.
- Collected sufficient admission donations to employ 15 part-time students throughout the year and to support the department's general operations for nine months.
- Identified and cultivated major donors for the Calhoun House, Trustee House, Hopewell and Hanover House.
- Implemented product development for the museum store.

- Coordinated with the Publications and Graphics Department the design of seasonal light pole banners serving as directional aids to the National Register Historic District and the Calhoun family reunion.
- Composed and delivered 10 proposals to state, federal and private funding sources for general operations and special projects.
- Performed an archaeological study of Cemetery Hill in preparation for preservation and expansion.
- Obtained financial assistance from the Department of Human Resources for support of the archaeology and historic site guide programs.
- Conducted the archaeology summer field school, which attracted participants from other major universities and archaeological societies.
- Promoted community relations through department staff and faculty volunteer efforts serving as guest lecturers and consultants to area organizations and educational institutions.
- Designed and conducted a noon-time walking tour series for the National Historic Preservation Week in May.
- Implemented and interpreted a model climate-control study in consultation with William Rose from the University of Illinois Building Research Council.
- Completed and implemented student projects in the museums such as developing a visitors survey, publishing a horticulture guide, computerizing the Hanover House collection inventory, collecting African American oral histories associated with the Calhoun and Clemson families, documenting the Clemson art collection housed in Sikes, and creating a structural model for the Hanover House relocation.
- Obtained the largest college and university feature story ever published in *USA Today* concerning the African American archaeology program.
- Developed the Friends of Historic Houses organization and implemented its stewardship together with the Clemson Fund.
- Published *Calhoun, Fort Hill and States' Rights: The Political Career of John Caldwell Calhoun*.
- Developed academic courses available in PRTM, Performing Arts, History and Architecture.
- Developed and implemented the Fort Hill Lecture Series, partially supported by the S.C. Humanities Council.
- Awarded a Conservation Assessment Program grant and implemented both the collections and buildings surveys.
- Awarded a grant from the S.C. Humanities Council which funded "Integration of Scholarly Research into Historic Museum Interpretation."
- Developed and delivered an interdisciplinary grant proposal to the U.S. Department of Education for development of a student leadership curriculum program at Clemson.
- Contracted and coordinated an appraisal of the Calhoun House and Hanover House collections in addition to the Clemson art collection.
- Developed an exhibit in Special Collections concerning University resources.
- Conducted an education seminar for the historic house tour guides at Monticello, in Old Salem and at the Museum of the Confederacy (Virginia).
- Developed and implemented a Calhoun Family Reunion for more than 200 descendants of John C. Calhoun.
- As a result of decreased state funding, the scope of the Department of Historic Houses was significantly reduced, and two full-time positions in the department were identified as potential "reduction in force" positions.

Governmental Affairs

There was a major restructuring and consolidation of the University's existing government interaction systems. The new Office of Governmental Affairs will coordinate all University activities involving state and federal government. Major responsibilities include: appropriation bill, legislation, informational requests, statewide legislative advocates and the board of visitors.

The University will continue to maintain an office (State Government Relations) and staff in Columbia that will report to the Governmental Affairs Office on campus.

Appropriation Bill '93-94

On June 14, the General Assembly adopted a \$3.7-billion budget. The bill included a \$250,000 increase for Clemson public service activities and \$4 million on the line for higher education. Also, there was a supplemental appropriations proviso directing up to \$30 million in excess funding to higher education. In addition there were more than 350 provisos attached. Many of the provisos affected higher education as well as selected programs at Clemson. A coordinated statewide group provided very positive support for this initiative.

Higher Education Accountability and Reform Act

A coalition of business leaders joined with the Council of University Presidents to advocate passage of a comprehensive package of regulatory reforms. This new bill will result in greater efficiency, accountability and managerial flexibility for all state agencies. The legislative liaisons for the state's public universities were directly involved in this effort.

Special Legislative Committees

Clemson University was very successful in getting approval for several important projects during the year. Examples included final approval and draw schedules for: Engineering Innovation Center, Animal Research Compliance Center, and the Continuing Education and Conference Center (Joint Bond Review Committee).

Approval for more than 100 research, service or educational projects was obtained during the past year. Examples included: Cooperative Extension Service projects, international programs and innovative educational techniques programs (Joint Appropriations Review Committee).

Government Restructuring

There was a major effort in the General Assembly to restructure state government agencies this past year. Early plans involved several University regulatory programs as well as a proposal to shift forestry services to Clemson. Appropriate University personnel cooperated with the General Assembly and were successful in maintaining present structure in Agriculture and Natural Resources programs.

Legislative Advocates

The Legislative Relations Committee of the board of visitors guided the formation of a Legislative Advocacy Group, a statewide network of Clemson supporters who are called on from time to time to contact legislators on issues of importance to the University. In September 1992, the Legislative Relations Committee met in Columbia with the staff of Clemson's Public Affairs Office and with other University officials to identify Clemson's legislative advocates for each of the state's 46 counties. Bill Craven, chairman of the committee, invited each individual identified to join this newly formed group.

Four orientation programs were conducted to accommodate the new advocates throughout the state. Meetings were held in Columbia, Greenville, Florence and Charleston during December 1992. Once the 1993 General Assembly session was under way, the advocates were called into action four times. The issues concerned

financial support for higher education, regulatory relief for state agencies, Clemson's public service activities and Clemson's budget for public service activities. The Legislative Relations Committee will continue to provide leadership and direction for the Legislative Advocacy Group.

Board of Visitors

One of the key volunteer groups which serves the University's institutional advancement program is the board of visitors. Through this program, 40 prominent business leaders serve as advisers to the University during two-year terms, visit the campus for updates on programs and priorities, and help provide a two-way communications link between the University and the public in their respective communities. The program is an important vehicle to involve key leaders in the University where no other opportunity may exist.

This important advisory group to the administration was very active during the past year. New officers elected at the November 1992 meeting were: Ted Pappas of Jacksonville, Fla., chairman; Dr. Dick Brackett of Charleston, vice chairman; and Tommie James of Camden, secretary.

For the third consecutive year, the board of visitors Award for Outstanding Graduate Teaching Assistants was presented at the board's meeting in April 1993. Two recipients each received checks for \$600. In December 1992, the solicitation of former and current members resulted in additional contributions to a fund which was created in 1990 and will eventually be used to endow this award.

Members of the board of visitors are nominated by the board of trustees and appointed by the president of the University. They are assigned to four working committees: academic affairs, legislative relations, media and research.

Legislative Cultivation

There was a major effort to keep members of the General Assembly informed about programs at Clemson. During the year, seven members of the Senate and 11 members of the House participated in individual and personalized visits to campus. In addition, there were "in district" visits with 13 individual senators and 26 individual House members. Also, there were more than 100 members of the General Assembly in attendance at Clemson's fourth annual catfish and grits dinner in Columbia.

Informational Service

There were hundreds of individual requests for information or assistance by members of the General Assembly this past year. Clemson personnel responded promptly to each request.

STUDENT AFFAIRS

The Division of Student Affairs enjoyed another successful and busy year of working with students in a wide variety of ways. Our mission is to provide programs and services that support enrollment, retention and graduation. We strive to create a safe and healthful environment in which learning opportunities extend beyond the classroom and in which intellectual, emotional, physical, social, cultural and spiritual development become part of the student's educational experiences. The following information represents the highlights that occurred during FY '92-93 for the various departments in Student Affairs.

The Student Development Department successfully enhanced the Student/Staff Partnership Program to increase communication and cooperation between students, staff and the community. The Interfraternity Council developed and implemented a revised expansion policy and plan for fraternities and sororities. The Greek Leadership Council conducted leadership classes for 54 fraternity and sorority stu-

dent leaders. *The Tiger* won best S.C. collegiate newspaper for the fourth straight year, and *The Chronicle* received the Pacemaker Award for the second consecutive year. WSBF increased and improved news and public service programming during the year as well.

Alcohol education was emphasized by providing a short course for students with minor alcohol violations conducted by Student Development and Housing. Students with disabilities continue to increase as do the programs to support them. There were special services provided to these students such as administering tests, scheduling classes, providing readers, tape recorders and tutors. The S.A.F.E. (Staff and Faculty Educators) and B.E.S.T. (Black Educational Support Team) programs continued to grow and provide additional services to students. The Inter-Service Council was formed this year as an umbrella council for service-oriented student organizations to provide support and additional help to these organizations. The F.Y.I. Camp (For Your Information Camp) was held for the first time to help expose students to academic, social and environmental concerns as they make the adjustment to college life.

The Campus Recreation Department continued to grow and expand in participation and usage. The J.R. Roy Cooper Recreation Area was placed under the management of Campus Recreation, and upgrades were made to the physical facility such as painting, reworking the electrical system and upgrading equipment. The aerobic program expanded to include step aerobics, which proved to be a tremendous success. Several new sports clubs also were added by demand.

The University Union went through a transition this past year and was reorganized internally to promote greater programming opportunities from the Activities Office and greater efficiency and revenue production for the operation areas. This was done to promote better service to students. Major concerts returned to Littlejohn Coliseum after an investment of more than \$250,000 in equipment. The Union invested approximately \$80,000 in the games area to put computerized scoring and a lounge area in the bowling facility. The end result was that more than 50,000 people attended major events sponsored by the Union, and participation by students was up more than 40 percent from last year.

Counseling and Psychological Services successfully merged these previously independent programs to form one comprehensive department. This required significant administrative coordination, but the end result was better, efficient service to students. A part-time female consultant was hired to address the critical need for female therapists. Recruitment was begun to hire a permanent full-time female therapist who has expertise in women's issues. Additional computers were added during the year to help the department move toward its goal of computerizing all offices. Two new entities were begun to enhance data collection regarding staff activities and client population characteristics, which will provide for better program evaluation and planning.

The Career Center registered 1,275 students with the KiNexus software package which puts the students in a national database and allows the center to send resumes to employers by specific search categories. Computerized career guidance systems were placed at 12 sites throughout the campus. An Afro-American Career Directory and a Career Workshop service were made available to minorities. The S.T.A.R.S. (Student Team Assists with Recruiting Services) program was implemented to improve the lines of communication between the Career Center and the colleges. A Career Development and Placement Committee also was created to develop better coordination between the center, faculty and staff involved in career planning or placement functions. Outreach efforts were increased by giving presentations to several thousand students in academic classes, workshops and student organizations. Additionally, outreach was extended to alumni in high level positions with industry to solicit their assistance in helping students find job opportunities.

The Health Services Department made significant improvements to improve its services to students. A computerized appointment system was implemented in the women's clinic and established patient registration, pharmacy, business systems

and prematriculation immunization on line as well. A new X-ray machine was installed, replacing one that was outdated and obsolete. The OSHA Hepatitis B vaccine requirements were administered to the Department of Law Enforcement and Safety, Housing, Facilities Maintenance and Operations, and the City of Clemson Police Department by the Health Services Department. The Aids Memorial Quilt was sponsored and hosted on campus, and more than \$2,400 was raised for service-providing agencies. There were numerous staff development and education programs made available to staff and students to increase awareness and knowledge of preventive health techniques and general health education.

University Housing continued to improve the efficiency of its operation by constructing a new housing storage facility and establishing procedures for purchasing and inventory control. The student housing reservation process was made simpler by replacing a \$95 deposit with a \$15 application processing fee. Several initiatives were undertaken to improve communication with students by conducting a comprehensive resident satisfaction survey and following the guideline that all housing committees and task forces will have student representation of 25 percent or more. A Housing Alternatives Task Force was created to outline recommendations to make housing more desirable to more students. Two major recommendations of this task force were implemented: single occupancy and graduate housing. Work continued on the construction of Holmes and McCabe halls which are set to be completed in early 1994.

The division continued the fund-raising campaign for the new student center. More than \$1 million was raised toward the goal of \$3 million in private gifts. We anticipate completing fund raising in 1993-94. This project is a top priority with students and a "campaign promise" for student leaders. Staff development continued to be a major focus of the division. The SALT (Student Affairs Leadership Team) Council assisted staff in learning about strategic planning and continuous improvement. All departments now have vision statements and have had some type of formal continuous improvement training opportunities. The future plan is to move away from the training focus to a results-oriented team approach for division-wide continuous improvement.

Municipal Court

The staff of the University's Municipal Court consists of one judge, a full-time judge who serves as the department head and a Clerk of Court. Formerly known as the University Recorder, the judge for the municipality of Clemson University hears appeals and renders decisions on all campus parking violations brought before the court. The judge also tries all persons charged with violating any ordinance passed by the board of trustees and any state laws that fall within the jurisdiction of the municipal judge. The municipal judge issues bench warrants, search warrants and arrest warrants for incidents arising on campus.

Police Department

The Police Department responded to 8,426 service calls, made 175 arrests and generated \$107,040 in fines; provided a total of 2,190 hours in training that ranged between the FBI Academy in Quantico, Va., to workshops provided on campus. Additional services contributed by the Police Department were providing assistance to the Clemson City Police Department 27 times, providing 3,512 escorts to the campus community and providing 1,670 non-paid service calls. The investigative division continued its work in assembling facts and evidence to document reported incidents, (including death investigation) identify offenders and assist in the administration of justice. Public Safety also participated in campus functions such as Alcohol Awareness Week, Rape Awareness Week, several speaking engagements and assisted with several dignitary protection assignments.

Special Operations

Special Operations developed and established a building security coordinator program and developed a comprehensive security guide. Student police assistance was provided for more than 250 special events, 547 hours for dispatch, 784 hours for traffic control painting and 39 project identification engravings. A total of more than 100 programs were presented to more than 4,000 individuals on various crime reduction subjects.

Clemson University Fire Department and Emergency Medical Service

During FY '92-93, this department responded to 407 fire and 399 emergency medical alarms. They were able to save \$1,428,000 in property from fire damage, while \$48,875 was lost. Significant staff training was provided on topics such as: fire suppression skills, emergency medical skills, leadership skills and hazardous materials recognition. Work and plans continued on securing a location for a new fire substation, including staffing and equipping it.

Department of Parking and Traffic Control

This department continued its mission of providing reasonable parking accommodations to all campus user groups including students, faculty, staff, vendors and guests. In addition to maintaining parking lots, the shuttle bus service is coordinated through this office. This past year a total of 708,085 passengers utilized the shuttle service. In regards to parking, 25,792 parking decals were issued in FY '92-93. Plans were begun to build a new 600-space parking lot in conjunction with the construction of a proposed student activities center. The computer system was enhanced to better identify the issue and payment of parking decals and tickets. Significant improvements also were made in collecting, depositing and tracking payments for decals and collection of parking tickets.

UNIVERSITY RESEARCH

Clemson University continues to be ranked by the National Science Foundation among the nation's top 100 educational institutions in total research and development expenditures.

During FY '92-93 the University received gifts, grants and contracts in excess of \$44.7 million, a 100 percent increase from 1989. Total sponsored programs and unrestricted research expenditures exceeded \$105 million in FY '92-93.

Clemson University's collaborative research activities include relationships with government, industry and other research universities. The University's research initiatives extend across the boundaries of academic colleges, institutes and centers to provide an effective, broad-based foundation for varied collaborative arrangements.

The scholarship of faculty and administration supported by such sponsored programs significantly contributes to the University's academic and classroom environment, and to maintaining an atmosphere in which basic problems are addressed and new ground is broken. During this past fiscal year the Office for Sponsored Programs processed more than 1,700 research proposals, grants and awards. The sponsored scholarship activities of faculty and administration serve a significant role in the attempt to mitigate the adverse effects of declining state support.

Department of Research Services

The Department of Research Services is responsible for coordinating institutional compliance with federal laws regulating the use of animals in research, teaching and testing activities, and human research activities. In addition, the department provides technical and professional support, as well as education and training for University personnel who use animals in research, teaching or testing activities. All campus animal facilities are managed by the department.

Notable accomplishments of Research Services during FY '92-93 include:

- Laboratory animal care technicians completed in-house education and training and passed certification exams to become certified as laboratory animal technicians by the American Association for Laboratory Animal Science.
- The Clemson University Animal Care and Use Seminar was conducted for all faculty, staff and students involved in animal research, teaching and testing. The seminar, conducted in January and again in August, provides information and training necessary to comply with federal regulations. Attending were 104 faculty, staff and students.
- Laboratory animal facility renovation plans funded by NIH were finalized for the Poole Agricultural Center and the Jordan Hall animal facilities. Renovations for the Jordan Hall animal facility have been completed. Plans were finalized for construction of a new animal facility for housing goats, sheep and swine for biomedical and agricultural research projects.
- An application for accreditation of all University biomedical and agricultural research facilities and programs has been completed and submitted to the American Association for Accreditation of Laboratory Animal Care.

Intellectual Property Committee

The Clemson board of trustees approved revisions in the Patent Policy on July 12, 1991, and the Software Copyright Policy on September 20, 1992. These policies were developed by the Patent Committee and recommended to the board through appropriate administrative channels. In addition, upon recommendation from the Patent Committee, the committee's name was changed to the Intellectual Property Committee to reflect the committee's broader scope that includes confidential technology (trade secrets), software copyrights and trademarks.

The committee reviewed 38 patent and computer software disclosures during the year and approved eight for processing by the University's private patent attorney and 17 for processing through Research Corporation Technologies (RCT). Under guidelines recommended by the committee and approved by the administration, a larger number of disclosures are being sent to RCT to minimize the cost to the University. Two option payments at \$1,000 each, paid to the inventors, were received on disclosures submitted to RCT. One \$3,000 acceptance payment, divided among the University, the inventor and the inventor's college, was received. A license agreement has been negotiated for the latter invention.

Estimated income from patents and software copyrights was approximately \$1.7 million. Five license agreements were completed during the year, and five other agreements are being negotiated. Eight U.S. patents were issued.

Emerging Technology Center

The Emerging Technology Development and Marketing Center (ETC) was established in 1987 supported, in part, by a grant from SCANA, Inc. The ETC was established to stimulate economic development in South Carolina by providing tech-

nical and marketing services that assist small-scale/start-up companies to develop commercially viable products; to promote ideas and products conceived by Clemson faculty, staff and/or students; to stimulate the transfer of technology to established industries to enhance their competitiveness; and to provide appropriate research, development and management/marketing services to established industries. The center assists approximately 100 inventors, entrepreneurs and new start-up companies annually.

ETC's major accomplishments for FY '92-93 include:

- Provided continuing technical and business leadership to the first S.C. "incubator" facility — the Clemson Center for Applied Technology (CAT). The CAT facility is owned by the Clemson University Research Foundation and managed by Enterprise Development, Inc., of S.C. (EDI). The facility is unique in South Carolina in that it "incubates" technology-based start-up companies, with an emphasis on technology developed at Clemson University. The incubator acolyte also assists in commercializing innovative new consumer, industrial, and medical products and processes. The 30,000 square foot facility was first occupied in early 1992 and now houses 10 start-up companies. The ETC director now serves on the CAT advisory board, as does Clemson University's vice president for research.
- CAT, in cooperation with the ETC, was selected to be the focal point for coordinating NASA's regional Technology Transfer Center outreach program in the Upstate through EDI.
- The ETC co-sponsored the fifth annual Dare-to-Deal, the state's only venture capital conference in the state. The conference is co-sponsored by EDI.
- The ETC, the Clemson University Library, and EDI partnered to operate the Technology and Business Information Center (TBIC), a comprehensive information and data base service. TBIC provides access and tailored searches of more than 4,000 on-line data banks worldwide. The TBIC provides a productive environment for developing technological and management/marketing ideas into more profitable business enterprises.
- The ETC represents Clemson University on the technology transfer council of the S.C. Universities Research and Education Foundation (SCUREF). As such, the ETC serves as an interface between SCUREF, the Westinghouse Savannah River Co. and faculty, staff and students at Clemson.
- The ETC organized and conducted a National Resource Seminar and Workshop in conjunction with the 1992 Inventors Expo in Greenville. About 135 company representatives from the area, and 38 state economic development agents participated in the event. Ten national and federal laboratories also participated in the seminars and exhibited their technology capabilities and resources services. This event was organized to train state outreach and extension agents and to expose state and regional industries to the vast technological resource of our federal and national laboratories.
- The ETC managed a booth at the regional Automated Manufacturing Expo held in Greenville in partnership with Battelle Memorial Institute.
- The ETC was represented in the Southeast Regional Federal Laboratory Consortia and the Greenville Chamber Science and Technology Committee.
- The ETC made presentations concerning technology transfer and economic development at 10 meetings including the International Technology Transfer Society annual meeting, the Southwest Regional Federal Consortia meeting, and the Association of University Technology Managers.
- To date, the ETC has been directly and indirectly responsible for locating more than \$15 million in support for small, expanding-growth companies in South Carolina and for inventors to commercialize their innovative products and processes.



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Total Number of Documents Printed	<u>255</u>
Cost Per Unit	\$ <u>6.70</u>
Printing Cost - S.C. State Budget & Control Board (up to 255 copies)	\$ <u>1707.59</u>
Printing Cost - Individual Agency (requesting over 255 copies and/or halftones)	\$ <u>-</u>
Total Printing Cost	\$ <u>1707.59</u>